o. XXXVII. December, 1909 No. 6.

# MUNICIPAL ENGINEERING

A MONTHLY MAGAZINE

DEVOTED TO THE IMPROVEMENT OF CITIES

CONCRETE CONSTRUCTION, PAVING, SEWERAGE, WATERWORKS, STREET LIGHTING, PARKS, GARBAGE DISPOSAL, BRIDGES.

PUBLISHED BY
MUNICIPAL·ENGINEERING·COMPANY
INDIANAPOLIS AND NEW YORK.

Registered in United States Patent Office

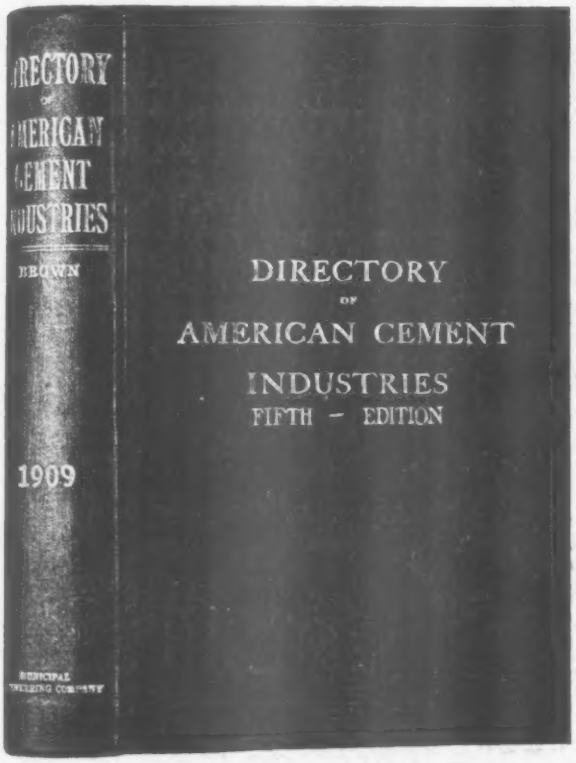
Two Dollars Per Year. Single Copies, 25 Cents.

# JUST OFF THE PRESS

**Fifth (1909) Edition**

## The Directory of American Cement Industries

**(Completely Revised)**




### What It Contains

The names, credit ratings and estimates of quantities of cement used and handled by:

25,000 Contractors and Users of Cement.
15,000 Dealers in Cement.
7,000 Engineers and Supervisers.
6,000 Companies Furnishing Machinery, Tools and Supplies.
300 Testing Laboratories.

Complete list of cement plants now operating, with full list of officials, and output, capitalization, brands, process and machinery.

Also all companies organized and plants under construction.

Complete list of brands of Portland and natural, domestic and foreign cements in the American market.

Complete list of sales agents and the brands they handle.

Complete alphabetical list of cement companies.

Complete list of makers of cement blocks, bricks, tiles and other cement products.

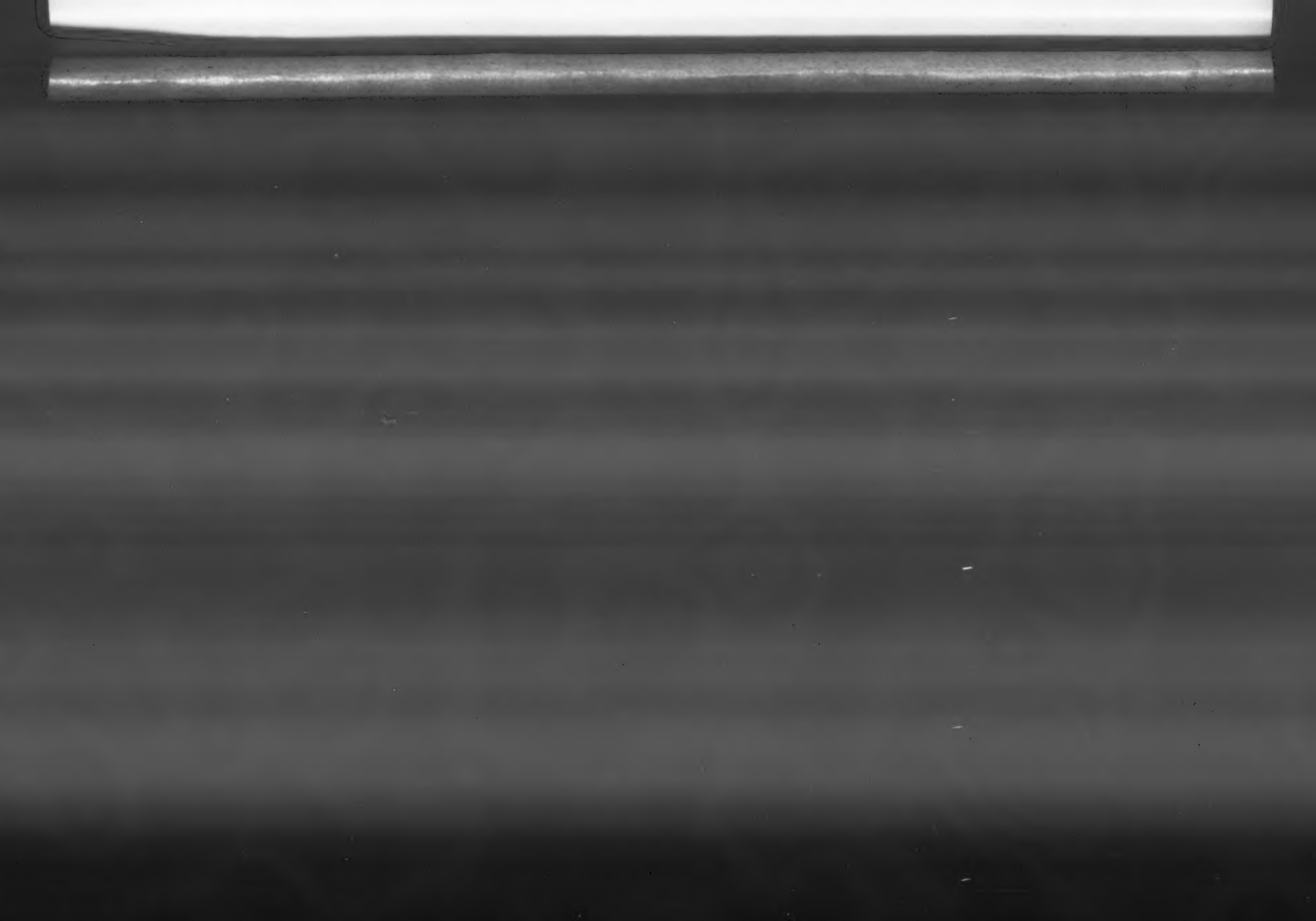
Manufacturers of reinforcing materials, concrete mixers, etc.

Manufacturers and large dealers in plaster.

Manufacturers of lime.

**Price $5.00, carriage prepaid**

**MUNICIPAL ENGINEERING CO. : Indianapolis**



# Municipal Engineering

PUBLISHED BY

MUNICIPAL ENGINEERING CO., Indianapolis

NEW YORK OFFICE, 1 BROADWAY

Entered at Post Office, Indianapolis, Ind., as Second-Class Matter.

Vol. XXXVII DECEMBER, 1909 No. 6

# Contents

**The Little Rock Convention of The American Society of Municipal Improvements.** ..... 361-364

**Disinfection of Sewage and Sewage Effluents.**
*By Earle B. Phelps, Asso. Am. Soc. C. E., Sanitary Chemist, New York City* 365-368

**Progress In Sewerage and Sanitation** .... *By George C. Whipple, Chairman, New York City* 368-371

**Education In Municipal Sanitation.** *By Prof. H. N. Ogden, Cornell University, Ithaca, N. Y.* 371-374

**Storm Drainage at Street Intersections.**
*By J. Heiskell Weatherford, City Engineer, Memphis, Tenn.* 374-379

**Creosote Oil For Wood Block Pavements.**
*By James Nisbet Hazlehurst, Consulting Engineer, Atlanta, Ga.* 379-381

**Three Years of Experience with Oiling Roads.**
*By Frederic A. Reimer, City Engineer, East Orange, N. J.* 381-383

**Public Parks and Street Trees In City Planning.**
*By William Solotaroff, Secretary of Shade Tree Commission, East Orange, N. J.* 383-386

**Concrete in Water Works Construction.**
*By William Curtis Mabee, Construction Engineer, Water Company, Indianapolis, Ind.* 387-392

**Editorial Comment.**
The Latest Commission Form of City Government—The Water Supply of the Panama Canal. 393-395

**The Question Department.**
Pavements for Hot, Dry Climate—Best Oil for Dust Laying and Road Preserving—Oil Emulsions for Treating Roads—Books on Railroad Construction—Methods and Cost of Rail Welding—Water and Lighting Rates in Small Cities—Concrete Water Tanks in Cold Climate—Makers of Turbine Water Wheels—Information About Water Works—Rates for Electric Current—Sewer Plans and Prices—Clay and Cement for Sewer Pipe Joints—Cities Adopting the Commission Form of Government—Construction and Operation of a Cement Plant—Design of Cement Floor ..... 395-400

**From Workers in the Field.**
Merchants' Association Review—The Water Supply of McKeesport, Pa.—Pavement Guarantees—Amiesite. ..... 400-403

**Municipal Matters in Court.**
Decisions of the Higher Courts of Interest to Municipalities—Installation of Water Meters Enjoined in Peoria—Capitol Avenue in Indianapolis Not a Boulevard—An Indiana Gravel Road Law Invalid, but Bonds Issued Under It Are Valid ..... 403-407

**Current Information.**
National Park Where Washington Crossed the Delaware—Timber Consumption in 1908—Madison Parks—Boston Chooses the Better Plan of City Government—Street Cleaning on Sunday—Gauze Masks for Street Cleaners—Illustrated Description of Southern Roads in Preparation—Tuberculosis Among Workers in Dust—Street Paving in Newark, N. J.—Irrigation Statistics in the Next Census—Disgraceful Condition of Water Supply of Niagara Falls ..... 407-409

**Municipal and Technical Literature.**
Sewage Purification for Washington—Improvements in Burlington, Iowa—Public Utility Laws of Wisconsin—Cost of Operating Washington Filter Plant—New Publications ..... 410-411

**Organizations and Individuals.**
Convention of National Municipal League—The Chicago Cement Show—Technical Meetings—Civil Service Examinations—The Technical Schools—Election of Mayors—Personal Notes ..... 412-416

**Machinery and Trade.**
Cement on The Farm—A New Cement Plant in Washington—Chemical Composition of Liquid Asphalt—Trade Publications—Trade Notes—Patents Concerning Bridges and Culverts .... 416-418

**Improvement and Contracting News.**

| | | | |
|---|---|---|---|
| Paving | 419 | Garbage Disposal, Street Cleaning and Sprinkling | 426 |
| Sewers | 421 | Parks | 426 |
| Water Works | 423 | Fire Apparatus | 426 |
| Bridges | 425 | | |
| Street Lighting | 426 | | |

$2.00 A YEAR. FOREIGN SUBSCRIPTION, $2.75 A YEAR. CANADA, $2.50 A YEAR.

# ASPHALT PAVING PLANTS

## STATIONARY
## SEMI-PORTABLE
## RAILWAY

54

IN SUCCESSFUL OPERATION BY CONTRACTORS AND MUNICIPALITIES. WE WILL BUILD TO SUIT YOUR REQUIREMENTS

# ACME ASPHALT
# 99% PURE

IS THE STANDARD HIGH GRADE ASPHALT FOR PAVING PURPOSES

LABORATORY SERVICE AND EXPERT ADVICE FURNISHED OUR CUSTOMERS FREE OF CHARGE

**WARREN ASPHALT PAVING COMPANY**

EAST CAMBRIDGE, MASS.

# MUNICIPAL ENGINEERING

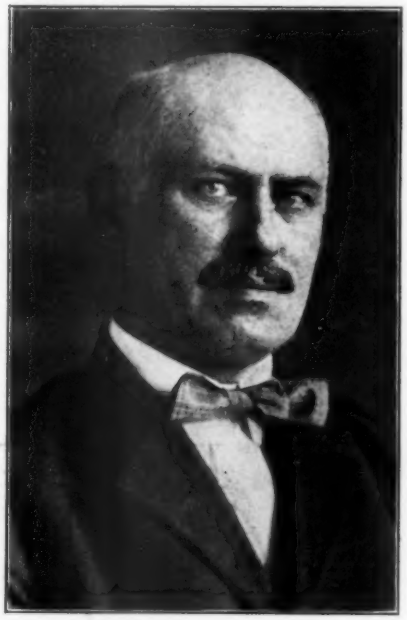
VOLUME XXXVII. DECEMBER, NINETEEN HUNDRED NINE. NUMBER SIX

## THE LITTLE ROCK CONVENTION OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

THE sixteenth annual convention of the American Society of Municipal Improvements, held at Little Rock, Ark., November 9, 10 and 11, with a trip about the city of Memphis, Tenn., on the 12th, was one of the most successful meetings the association has ever held, whether considered from the standpoint of registration, increase in membership, attendance of local officials and citizens, number and quality of papers presented, interest in proceedings and in the observation and entertainment features or in exhibits. Other conventions have excelled in one or two of these particulars, but none has held so uniformly high a standard throughout.

The city of Little Rock, through its city officials, board of trade and the efforts of individuals, made ample provision for the entertainment of its guests, and the handsome new city hall was used for the meetings and the exhibits. The hotels, notably the Marion, at which the reception was held, and the Capital, with a luncheon for the ladies of the party, showed what can be done in modern buildings having all the modern equipments. The ladies' committee, under the efficient leadership of Mrs. E. A. Kingsley, filled full the time of the few visitors from the families of delegates. The railroads, street railway and individuals with automobiles kept the visitors moving about the city even during convention sessions to some extent.

President Owen called the first session of the convention to order promptly on time, and there was less than the usual delay in beginning each of the sessions, so that, by putting in all the time provided for in the program, it was possible to cover nearly all of the long list of papers presented, which will be found printed in the November number of MUNICIPAL ENGINEERING. An unusual number of authors of papers failed to attend the meeting, but nearly all of them had forwarded their productions, and the few failures were more than made up by papers received after the publication of the official program. The time for presentation of papers was shortened somewhat by reading some of the papers by title only, thus giving space for some interesting discussions. Several of the papers presented appear in this number of MUNICIPAL ENGINEERING, and others will be given in subsequent numbers.



JULIAN KENDRICK, BIRMINGHAM, ALA.
President A. S. M. I.

A change in name of the organization was again presented for discussion, and it was clearly shown that the

membership desires to adhere to the principle upon which practically all of the work of the society has been based. The call for the first convention expressed the desire of those engaged in the direction of the improve-

FRED GIDDINGS, ATCHISON, KAN.
First Vice-President A. S. M. I.

ment of municipalities for meetings at which to discuss their problems and gain direct information concerning the methods used by others. It was the evident intention to call upon the experts among the members for guidance, and consequently a large share of the work of the society has been done by the engineers. Should the society restrict its field even by so little as a change of name, with no further change in the constitution, it would, in the opinion of most of those joining in the discussion, be abandoning one of its most important functions, that of supplying opportunities for the spread of information among all the city officials, bringing together the experts in the financial, engineering and executive departments and those who desire to add to their information and to their value as city officials, where one can present to others his difficulties and get authoritative answers to his questions.

The convention had the unusual honor of a speech of welcome from the Governor of Arkansas, as well as others from the acting mayor of the city and the president of the board of trade.

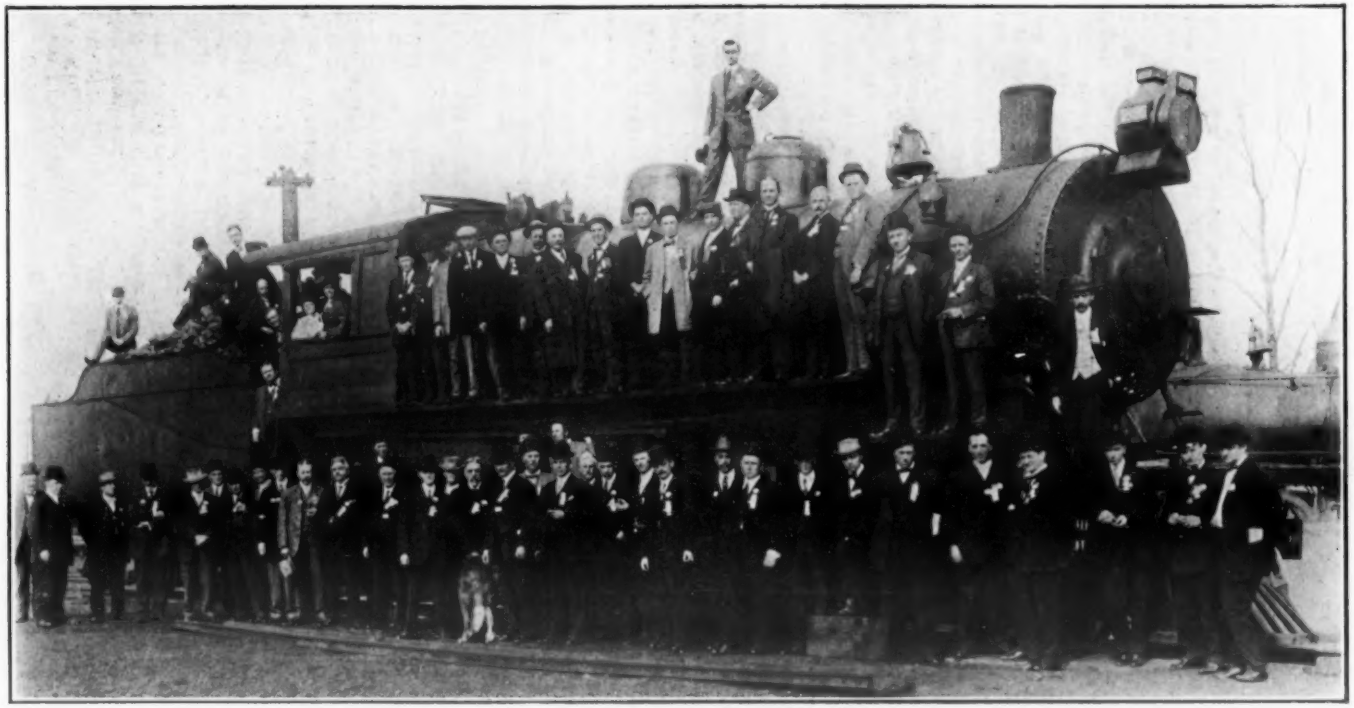
The Little Rock newspapers were particularly alive to the possibilities of benefit to the city from the experts gathered at the convention, and printed each day interviews with delegates regarding the problems of municipal improvement which are before that city. At least three of the members were called upon also for special service to the municipality and to individuals regarding sanitary questions under active consideration.

The railroad trip about the city took the visitors through the shops of the Iron Mountain Railroad, where the accompanying picture of about half the delegation was obtained, grouped about and on the largest locomotive of the system; a trap-rock quarry and crusher of the Big Rock Stone and Construction Company, the Dixie Cotton Oil Company's mill, and the new paving brick plant of the Arkansas Brick and Manufacturing Company. It was

E. A. KINGSLEY, SUPERINTENDENT PUBLIC WORKS, LITTLE ROCK, ARK.
Second Vice-President A. S. M. I.

rounded off by a luncheon in the power plant of the Little Rock Railway and Electric Company.

At the election the names of officers were moved up one step, and now stand as follows:



THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS AT LITTLE ROCK.

Julian Kendrick, Birmingham, Ala., President.

Fred Giddings, Atchison, Kans., First Vice President.

E. A. Kingsley, Superintendent of Public Works, Little Rock, Ark., Second Vice President.

Ben E. Briggs, City Engineer, Erie, Pa., Third Vice President.

A. Prescott Folwell, New York, and E. S. Rankin, Newark, N. J., were reelected Secretary and Treasurer.

The next meeting will be held at Erie, Pa.

The opinion of the *Arkansas Gazette* regarding the methods of conducting the convention is expressed in the following editorial:

"Our report of the first day's session of the American Society of Municipal Improvements gathering said the convention violated all the traditional rules for conventions by meeting on time. Further:

"A convention of engineers is entirely different from the ordinary convention. There are no fervid outbursts of oratory, no long-winded discussions by individuals who enjoy hearing themselves talk. The papers are all short, pithy and on topics that are of absorbing interest to the engineers themselves.

"The discussions of the papers are equally concise and to the point. The engineers, quite in keeping with their profession, arise, give their opinions or their experiences in as few words as possible, and resume their seats. When President Owen considers that everything worth while has been said on a topic, he passes on to the next. It is all very straightforward, businesslike and unostentatious.

"A strange sort of convention, indeed! A convention without oratory, without long papers, without lengthy rambling discussions, where extraneous matter is excluded and all is to the point, and where the presiding officer, when he judges that everything worth while has been said on the pending subject, passes on to the next subject. Ever seen a convention like that before?"

Nearly fifty of the delegates spent Thursday afternoon at Hot Springs, returning in time to go with the other half of the convention to Memphis Thursday night.

City Engineer J. Heiskell Weatherford and the Business Men's Club, headed by Mayor James H. Malone, members of the club, officers of the street railway company, and others, piloted the members about the city on special cars, visiting the water works plant, main station, Overton Park, the Tri-State Fair Ground and Driving Park, and a great cotton compress and warehouse, with a luncheon at the club. The street paving and drainage problems of the city were inspected on the way. MUNICIPAL ENGINEERING will shortly devote a special article to this subject.

The interest in the convention was much enhanced by the exhibits made by Warren Brothers Company, makers of bitulithic pavements, with the Southern and Texas Bitulithic Companies; Barrett Manufacturing Company, with tarvia; the Standard Asphalt and Rubber Company, of Chicago, with Sarco for roads and brick filler; the Canton Culvert Company, of Canton, O., with corrugated steel culverts; the Lock-Joint Pipe Company, of New York, with Meriwether's reinforced concrete sewer and conduit pipe; the Texas Company, of New York and Dallas, Tex., with Texaco, artificial asphalt; the Kettle River Quarries Company, of Minneapolis, Minn., with apparatus for testing the creosoting of wooden paving blocks and the creosoted blocks; the Arkansas Brick and Manufacturing Company, of Little Rock, with new paving brick; the Big Rock Stone and Construction Company, of Little Rock, with crushed stone; the International Creosoting and Construction Company, of Galveston, Tex., with creosoted timber; the Post Pipe Company, of Texarkana, Tex., with vitrified sewer pipe; the Pulaski Stone Company, of Little Rock, with crushed stone; the Altoona Portland Cement Company, of Kansas City, Mo., with Portland cement; and the Little Rock Railway, Light and Power Company, with a section of street railway track laid with concrete foundation, showing the construction with brick and with creosoted wood paving.

# DISINFECTION OF SEWAGE AND SEWAGE EFFLUENTS.*

*By Earle B. Phelps, Asso. Am. Soc. C. E., Sanitary Chemist, New York City.*

IN former days the purification of sewage was commonly understood to mean the removal and final oxidation of practically all the contaminating matter present, including the germ life. The old slow-sand filter was relied upon to accomplish this end, and, although in the majority of cases its efficiency is not at all times of the degree indicated, yet effluents can be produced under favorable conditions which approximate drinking-water standards. However desirable such results may be, the large amount of land required, about an acre for every thousand inhabitants, makes the price almost prohibitively excessive in the region of large cities. Therefore the tendency of the times has been toward intensifying the natural process of purification to the end that more sewage may be treated upon a given area. Progress in this direction has been rapid and satisfactory, so that with a modern trickling filter the wastes of twenty thousand persons can be adequately disposed of upon an acre of filter surface.

With the increased rate of treatment, however, there has come a consequent deterioration in quality. The removal of bacteria in particular has ceased to be one of the chief factors in sewage purification. To what extent pathogenic bacteria are removed by filters of coarse stone is a somewhat debated point at the present time, but it is the writer's belief, based upon many years of experimental study and the perusal of the available evidence, that the removal of pathogenic bacteria by modern processes of sewage disposal is at least not more rapid nor more efficient than that which is observed naturally in a polluted stream. In other words, the same natural processes are at work, and the conditions found in the purifying mechanisms have no especial detrimental effect upon the bacteria in question. This at least is the result of investigations upon the fate of non-pathogenic bacteria of certain specific types which have been studied most exhaustively. Reference is had particularly to the bacillus coli. It has been shown repeatedly that this organism is not destroyed in modern sewage disposal plants to an extent which would have any sanitary significance. It has further been shown under controllable experimental conditions that the resistance of this organism to unfavorable surroundings, to heat, to cold, to chemical poisons, and to simple storage in water, is not much greater, if any, than that of the typhoid bacillus. Therefore, in the absence of any direct evidence to the contrary, it is not only just, but quite necessary, to assume that the fate of the bacillus coli in the various processes of sewage purification is indicative of the fate of its more undesirable relative, the typhoid germ. In summing up the evidence in this matter, as presented by English experience, Houston concluded that the biological processes at work in the filters are not strongly inimical, if hostile at all, to the vitality of pathogenic germs.

Granting, then, that these sewage filters present no material barrier against the passage of bacteria from the sewage to the stream, we are confronted by a still more perplexing and unsettled question, namely, the degree of purification which may reasonably and economically be demanded. Sewage purification in the complete sense previously described leaves little to be desired as far as results go, but partial purifications of one kind or another are also possible, and in many cases may satisfy the local requirements. In brief, we can remove suspended solids, which cause offensive deposits in streams, unless the flow be always rapid; we can oxidize organic matter which will otherwise produce anaerobic or putrescible conditions in a stream, unless also the final dilution be sufficiently great; or we can destroy pathogenic germs which might otherwise endanger water supplies or shellfish beds. Finally, we can combine any two or all three of these partial methods. The adoption of a purification process fitted to the local requirements and going no further than these requirements demand, results in a two-fold good. Communities installing the works are saved unnecessary expense and more communities are finding it possible to purify their sewage, owing to the simplified processes now employed. An example has recently come to the writer's

*A paper before the American Society of Municipal Improvements.

notice. A public institution secured an appropriation of eighteen thousand dollars for sewage disposal works. Plans and bids were called for and the lowest bid received called for a total expenditure of twenty-two thousand dollars for septic tanks, special pumping apparatus and sand filters. This amount of money was not available, the appropriation lapsed, and the work was dropped for a year. A special study of the local requirements showed that by no possibility could any physical nuisance occur below the outfall. The discharge was into tidal waters, the volume of water was great compared with the volume of sewage, and the flow was sufficiently rapid at all times to prevent sedimentation. Extensive oyster beds, however, would be affected by the discharge of crude sewage at this point; furthermore, any large floating particles would be unsightly. A system involving screening, partial clarification and complete disinfection has been designed for this institution. This system meets the local requirements far better than the first plan proposed, since special care is taken to prevent the discharge of bacteria prejudicial to the oyster beds. The total cost, including the capitalization of the extra operating expenses of the disinfecting process, will not exceed five thousand dollars.

This possibility of adjusting the character of the purification works to its requirements not only resulted in the saving of public funds, but what is of vastly more importance, made it possible to put in disposal works which might otherwise never have been installed.

Let us consider now the methods by which disinfection may be brought about and the all-important matter of costs. Among the agents of disinfection, chemical and otherwise, which have from time to time been proposed, and many of which have been used in sewage work, the following may be mentioned: Heat, lime, acids, ozone, the various compounds of chlorine, including chlorine gas, hypochlorites and electrolytic products, the salts of copper, manganates, permanganates, and various organic substances. In an earlier paper the writer has considered the historical development of sewage disinfection and has gone with some detail into the possibilities and the costs of the various agents mentioned. It will be sufficient for present purposes to state that all of these agents, save the chlorine compounds and the salts of copper, are prohibitively expensive, and that of the latter two, chlorine in the form of hypochlorites appears to be by far the most economical and satisfactory disinfecting agent. Early experiments with hypochlorites in both England and Germany indicated that very satisfactory results could be obtained on a practical scale. The costs, however, of these processes were still too high for ordinary routine use as compared with the costs of other sewage disposal processes. Investigations made later in this country by the writer and others indicated that the high cost of the German results, in particular, was due to the excessively high standards of bacterial removal demanded. For example, in most of the experiments referred to it was thought to disinfect the sewage to such an extent that the bacillus coli would not be found in one litre of the disinfected water. Since this organism occurs in ordinary sewage in numbers ranging anywhere from ten thousand to one million per cubic centimeter, it is quite evident that the degree of purification called for in this case is far in advance of any practical requirements. Our own investigations show that it was comparatively easy to secure a reduction of total bacteria and of the bacillus coli amounting to from 95 to 99 per cent., and that beyond this point excessive amounts of disinfectant were necessary. This phenomenon of the resistant minority, as Whipple terms it, is common to all kinds of sterilization, whether it be by heat, cold, light, chemicals, or other means. It is therefore decidedly more practical to determine how far disinfection may be carried at a reasonable expenditure than to attempt the ideal complete sterilization. To put the case concretely, it might be found that the pathogenicity of an effluent could be reduced 90 per cent. by the expenditure of a certain sum of money, 98 per cent. by the expenditure of twice that sum and 99 per cent. by the expenditure of five times that sum. The first, or even the second, proposition might develop into a feasible plan, while the last might be prohibitively expensive. From the practical engineering point of view, therefore, it is plainly our duty to achieve 96 to 98 per cent. reductions at reasonable working costs rather than to secure the ideal at prohibitive costs.

On this principle, therefore, it was determined to learn to what extent sewage filter effluents, and even crude sewage itself, could be purified at costs which were commensurate with the results and with the costs of other

purification processes. For this purpose experiments were carried on at the sewage experiment station of the Massachusetts Institute of Technology for a period of over two years. Simultaneously with these investigations, work was also under way on a practical scale at Red Bank, New Jersey, where 250,000 gallons per day of septic effluent was treated. Also, through co-operation with the sewage commission of the city of Baltimore, experiments extending over about one year were made at the experimental plant there. At Baltimore the effluent treated was from a septic tank-trickling filter system. It will not be necessary to go into the details of these various investigations, which have already been published in full by the United States Geological Survey, through whose financial aid they were made possible. In brief, it was found that the satisfactory disinfection of a trickling filter effluent which has been purified to a condition of non-putrescibility can be accomplished by the application of ordinary commercial bleaching powder in the proportion of three parts per million of available chlorine, or approximately seventy-five pounds of bleaching powder per million gallons of effluent. The removal of bacteria possible in this way will average over 95 per cent., making a combined bacterial efficiency for the filter and disinfection of between 98 and 99 per cent. The cost of such a process will range from $1 to $1.50 per million gallons, depending somewhat upon the size of the plant and somewhat upon the transportation charges on the bleaching powder. Effluents of higher degrees of purity can be disinfected at still lower costs. Five parts per million of available chlorine, or 125 pounds of bleaching powder per million gallons, probably represents the maximum amount which would ever be required for the treatment of effluents of a poorer quality. The disinfection of crude sewage to the same final condition as that mentioned above, namely, the removal of over 98 per cent. of its total bacteria, may be accomplished by the application of from five to ten parts per million of available chlorine or from 125 to 250 pounds per million gallons of bleaching powder, the amount depending upon the character of the sewage. The cost will range correspondingly from $1.50 to $3.50 per million gallons. The disinfection of the septic sewage required the application of from ten to fifteen parts per million of available chlorine, or of from 250 to 375 pounds of bleaching powder per million gallons. If no further purification is required than that given by the septic action and the disinfection, it will probably be found advantageous to reverse the processes, disinfecting the crude sewage before it enters the septic tank. The resulting development of ordinary bacteria within the tank is of no sanitary significance, and it is doubtless of some advantage in the subsequent purification of the organic matter in the stream to discharge an effluent rich in the bacteria which assist in that purification. The removal of the bacillus coli in all of the above cases is usually somewhat more complete than that of the total bacteria cited. Under the conditions of a laboratory experiment, the results of hypochlorite disinfection on both the colon and the typhoid bacilli, carried out under exactly the same conditions, were identical. It seems reasonable, therefore, to assume that the viability of the typhoid germ under working conditions in practical sewage disinfection is at least no greater than that of the colon bacillus, and therefore no greater than that of the sewage bacteria as a whole. Consequently, the disinfection results obtained with the total bacteria may, in the case of chlorine disinfection at least, be referred directly to the typhoid bacillus, with assurances of reasonable accuracy and of some margin of safety.

In the investigations made the subject of electrolytic processes of treatment received considerable attention. Many such processes have been developed and a few have actually been installed. The claims of some of them are so ridiculous that the process disbars itself from scientific consideration. There seems to be something about such terms as "electrolytic" which appeals strongly to the layman, and this weakness on the part of local boards of public works has been played upon in many instances for the purpose of marketing certain patented processes of very dubious merit. At the same time there are electrolytic processes for the manufacture of chlorine which are undoubtedly successful, and, in fact, most of the bleaching powder which we use in this work is made by an electrolytic process at Niagara Falls. It happens, however, that chlorine is practically a by-product of the much more important alkali industry, and that its price is consequently fixed at almost the cost of materials and freight. Granting to such a process free power and theoretical

efficiencies, the cost of manufacture on a scale small enough for an ordinary sewage disposal plant would still be above the market price of bleaching powder. Therefore, one is not mistaken in stating that under present market conditions chlorine can be purchased much cheaper than it can be made, even under the most favorable circumstances.

In conclusion, the following table of the total costs of operation, including interest on installation, is given. It is based upon the plant having the capacity of five million gallons per day, the costs being per million gallons. In general, plants of a larger capacity could be run somewhat more economically, while on smaller plants the labor items would probably mount up somewhat faster. The costs, as will be noted, all refer to the amount of available chlorine in parts per million found necessary. In this way the table can be applied to any situation after it has been determined by experiment how much available chlorine will be required to produce the desired degree of disinfection. In a rough way, the figures already given, namely, from two to five parts for filter effluents of varying quality, from five to ten parts for sewages, and from ten to fifteen or more parts for septic sewages, may be used. A special column is given to the matter of storage tanks, since in many locations this item would not be an extra charge, existing tanks being used. As to the application of results obtained in one place to conditions met in another, it may be said that the reactions involved are particularly free from interference on the part of the mineral constituents of sewage, a condition which has not been found in the case of copper. Thus there is reason to believe that the results given here are of practically universal applicability.

| Available Chlorine (in parts per million) | Bleach, pounds per million gallons | Time of contact in hours | Cost per million gallons | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Storage tanks | Other fixed charges | Bleaching powder | Labor | Power | Total |
| 1 | 25 | 5.0 | $0.10 | $0.02 | $0.30 | $0.10 | ..... | $0.52 |
| 2 | 50 | 2.5 | .05 | .04 | .60 | .10 | ..... | .79 |
| 3 | 75 | 1.6 | .04 | .05 | .90 | .10 | $0.02 | 1.11 |
| 4 | 100 | 1.2 | .03 | .07 | 1.20 | .10 | .02 | 1.42 |
| 5 | 125 | .8 | .03 | .08 | 1.50 | .10 | .03 | 1.74 |
| 10 | 250 | .5 | .02 | .16 | 3.00 | .15 | .06 | 3.39 |
| 15 | 375 | .5 | .02 | .24 | 4.50 | .20 | .09 | 5.05 |

## PROGRESS IN SEWERAGE AND SANITATION.*

*By George C. Whipple, Chairman, New York City.*

IN reviewing the progress of events in the field of sewerage and sanitation since the last report of the committee in 1907 it may be said at the outset that there has been a substantial advance all along the line. As a result of the broadening of the application of the sanitary arts the human race is becoming healthier and the average span of life is lengthening. Our cities, in particular, are becoming cleaner and safer places in which to live. This can be seen by comparing the vital statistics within as short a period as two or three years.

This report cannot pretend to enumerate all the interesting sanitary events since 1907. It can only consider certain topics and cite illustrations under each that are typical of what is taking place.

Perhaps the most striking fact in recent years is the extent to which the principles and discoveries of sanitary scinece are being popularized. The addresses and articles that appear in the scientific journals soon filter down through the magazines and dailies to the general reader. In this process sometimes things become exaggerated and we are treated to a series of scares. Thus we have had the oyster scare,

*A paper before the American Society of Municipal Improvements.

partly true, but much overworked, and we have had the fly scare, also partly true and also much overworked. Experience, however, causes the sharp corners of these theories to be worn off and the net result is a real enlightening of the public.

More important, perhaps, than the education of the public is the education of the great body of health officers throughout the country. In the past these well-meaning officials have been conspicuously inefficient. The medical side of the work has been unduly emphasized. It is gradually becoming recognized that this is a distinct profession, demanding a peculiar education and a peculiar combination of qualities. The important event in this direction is the establishment of new courses in some of our universities to meet this demand. Harvard University, for example, is planning to offer such a course. Cornell University has, under the auspices of the New York State Department of Health, inaugurated an extensive lecture course. Columbia University has established a similar course and also a new course in sanitary engineering. These are merely illustrative of what is taking place throughout the country.

Conferences of health officers are becoming more and more popular, and the character of the discussions in these meetings is materially improving. In some states the attendance of the health officers is compulsory and the expense of sending the delegates is borne by the community from which they come.

In the field of investigation, first mention should be given to the Pittsburg Survey. This is a sociological and sanitary study conducted by a corps of experts suported by the Sage Foundation. Its object is to investigate in statistical detail the condition of the city, with special reference to the operatives employed in the great steel manufactories. Out of this has developed the typhoid fever commission, that is making a careful study of all the local conditions that have a bearing upon the spread of this disease. The immediate occasion for this work is the fact that a new filter plant is now in operation, and it seems an opportune time to carry on an extensive campaign against this disease in all directions.

One of the greatest object lessons in public sanitation has been the Tuberculosis Exhibit that was shown first in Washington and afterwards in New York and other cities, and that has been reproduced on a small scale elsewhere throughout the country.

Mention should be made, also, of the proposed organization of sanitary districts in certain parts of the country for the study of interrelated sanitary problems of water supply and sewage disposal; of the establishment of a new section of vital statistics in the American Public Health Association; of the attempt to standardize the statistics of sewerage and sewage disposal by the use of a schedule prepared by the sanitary section of the Boston Society of Civil Engineers, and of the activity that some of our large life insurance companies are displaying in sanitary affairs.

The work of the various experiment stations that are engaged in studying methods of sewage disposal is going steadily on. The Sewage Experiment Station of the Sanitary Research Laboratory of the Massachusetts Institute of Technology has been transferred from Albany street to the pumping station of the Boston main drainage works, at Dorchester, where there is opportunity for carrying on the work on a larger scale than before, utilizing a sewage of different character. The sanitary district of Chicago has established an experimental sewage purification plant in connection with the investigations being made of the sewerage of the Calumet river section of that city.

An experiment station has been established at Philadelphia on the site of the old Spring Garden water testing station. An experimental station is also in operation at Gloversville, N. Y., where the trade waste problem is an important one.

New laws relating to stream pollution have been passed in a number of states. In Pennsylvania the State Commissioner of Health was granted large powers by the law of 1905 and ample appropriations have been provided for the work. This department is now very active and its influence is beginning to be felt throughout the state. Under the act referred to the Health Commissioner has ordered a number of cities in the state to purify their sewage before discharging it into the streams. The question of sewage purification has been considered by a number of these cities, but in some of them the people have voted down the bond issues. One reason for this was doubtless the false impression that had been in some way obtained that the state would eventually pay part of the cost of any treatment that was demanded.

New Jersey has been face to face with the same problem. The State Sewerage Commission has been abolished and its functions invested in the State Board of Health. New Jersey and Pennsylvania are together making a determined effort to clean up the waters of the Delaware river, which flows between the two states. Injunction suits have been instituted in some instances to enforce these laws. The cases are coming up for trial in the near future, and it will be interesting to see how the courts view this matter of state control, as provided for by this recent legislation.

The State of Ohio has passed an act known as the Bense Act of April 7, 1909, which is, in some respects, different from those that have been passed elsewhere. According to this act, the State Board of Health is given control of the design, and, what is particularly important, of the operation of water purification and sewage disposal plants. Although the act is drastic so far as stream pollution is concerned, it gives the offending parties the opportunity of a hearing, and the State Board of Health cannot act without the approval of the Governor and the Attorney General. An apparent defect in the act is the failure to provide a suitable penalty for non-compliance. The act provides for elaborate studies and investigations in connection with water works, sewage disposal and pollution of streams, and the state has been very liberal in its appropriations for this purpose. Already numerous investigations have been carried on under the act. Some of these have involved problems of trade waste disposal as well as of city sewage.

Indiana has passed a somewhat similar law and other states are likely to follow these examples, and in general there is a well-marked tendency to place the authority over the pollution of streams in the hands of the State Department of Health.

A case that is attracting a good deal of attention at the present time is that of the pollution of New York harbor by the proposed Passaic Valley trunk sewer. After many years of efforts a plan for cleaning up the Passaic Valley culminated in the proposition to construct a large trunk sewer to receive the sewage of the cities and towns along the river and discharge it into the harbor of New York at Robin's Reef, after a preliminary process of screening and an elaborate system of dispersion at the outfall. New York State, acting through citizens' associations and through the state authorities, and finally the United States Government, objected to this method of disposal and instituted a suit before the United States Supreme Court, which is now pending. Some interesting developments are likely to be the outcome of this, one of these being a better understanding of the actual factors involved in the pollution of harbors and tidal estuaries. This topic is now being carefully studied by the Metropolitan Sewerage Commission. This commission has recently published a Digest of Data relating to the sanitary conditions of New York harbor, which gives a summary of the work done prior to the year 1908.

During the past two years a number of projects for the disposal and purification of sewage have been brought to a culmination. The new systems of drainage and sewerage in New Orleans have been put in operation. Already over 300 miles of sewers have been constructed, but about 63 miles of sewers remain to be built in the built-up portions of the city. Up to date New Orleans has expended upwards of $17,000,000 on its drainage, sewerage and water works projects. When the peculiar topographical conditions of the city are considered, the value of these projects to the people can scarcely be overestimated. The effect that the operation of these projects will have upon the death rate of the city will be watched with interest by sanitarians.

At Columbus, Ohio, the largest purification works in this country, built along modern lines, have been put into operation. The works consist of septic tanks, sprinkling filters and final settling basins. Numerous other smaller purification plants have been built along similar lines in various parts of the country.

The work of sewering the city of Baltimore and constructing septic tanks and sprinkling filters is going forward, although it will be some time before they are completed. It is proposed to disinfect the effluent with chloride of lime instead of subjecting it to sand filtration, as was first proposed.

The city of Toronto, which now discharges its sewage into Lake Ontario, has been advised by an American and an English expert that its sewage does not need other purification than can be obtained by septic sedimentation before being discharged into the lake. Works are being constructed in accordance with this advice.

Many problems connected with sewerage and sewage disposal have been

under discussion since the last committee report, as, for example, the question of sewer gas, the Hampden method of sewage purification, the effect of sewage on concrete, etc.

The sewer gas problem was threshed out and apparently settled many years ago, but recently attention has been called to it through the publications of certain European bacteriologists and through the investigations that have been made by Prof. C. E. A. Winslow, of the Massachusetts Institute of Technology, Boston, Mass. These investigations have shown that the danger of bacterial contamination from sewer gas is very small indeed, and that in most cases it is quite negligible. There still remains, however, the possibility of debilitating effects caused by breathing the impure air. The upshot of the lessons learned from these researches seems to be that what is needed in our houses is simpler and better plumbing.

The Hampden doctrine, so called, has been a subject of much discussion in the foreign journals, but as yet it has not attracted much attention in this country. Briefly, the idea is that the purification of sewage takes place through physical agencies rather than through bacterial agencies. Great stress is laid on the effect of sedimentation, the precipitation of the colloidal matter and the influence of absorption. It has been called the Hampden doctrine in England because of the work of W. O. Travis at Hampden, where a hydrolytic tank was first constructed, embodying these principles. The ideas themselves, however, are largely of German origin, although Dr. Travis deserves credit for emphasizing them and putting them into practice. Like most dogmatic statements, the Hampden doctrine gives undue emphasis to one phase of truth. It is a phase, however, that is well worth study.

Another great problem before the country is that of rural sanitation. In this connection it is interesting to learn that the local Board of Health of the city of Richmond, Va., has adopted rules and regulations governing the use of privies in the city. Among the minimum requirements are that the privies shall be water-tight and shall be tightly sealed against the entrance of flies. Windows shall be screened, doors and seats shall be self-closing. The receptacle for the fecal matter shall be of tight construction, shall not project beyond the house, and shall be protected from rainwater. Failure to comply with the prescribed minimum requirements is made to constitute a public nuisance. Although this is a matter of detail, yet it is an important one, and is a decided step in advance, which may be well followed by many cities where no sewerage system exists.

---

# EDUCATION IN MUNICIPAL SANITATION.*

*By Prof. H. N. Ogden, Cornell University, Ithaca, N. Y.*

IN a recent number of the *Outlook* the editor points out that the spirit of altruism in the world is advancing with civilization; that charity is being supplanted by social action, and he welcomes the feeling of shame which is beginning to permeate a city when such crimes as high death rates from preventable diseases, as the distribution of impure milk, as an offensively located garbage dump, as municipal indifference to a polluted water supply and as reckless disregard to the wholesale slaughter caused by a careless sewage disposal, are committed. The editorial expresses the hope that, in the ideal city of the future, the municipal government will exercise correction and control, and that the people as a whole will take self-respecting care of themselves, that the feeling now germinating, namely, that individual happiness can be secured only by furthering the happiness of one's fellow-beings, will grow until it controls the entire municipal organization.

Such an idealistic condition of affairs may, in time, truly come to pass, but one must frankly acknowledge that such a happy condition of things as the editor dreams of is as yet far from realization. In one of his addresses Huxley says: "The higher the state of civilization, the more completely do the actions of one member of a social body influence all the rest, and the less possible is it for one man to do a

*A paper before the American Society of Municipal Improvements.

wrong thing without interfering more or less with the freedom of his fellow-citizens."

We boast in this age of our civilization; we pride ourselves on the mechanical improvements of the present day; we glory in the magnificence of public buildings, in the speed of communication established between cities and throughout the suburbs of individual cities, but we forget that one of the responsibilities of civilization is to appreciate the dependence of one member of society on another, growing more and more acute as civilization itself develops. There comes, then, with civilization, a greater and greater need of that appreciation, a stronger and stronger sense of responsibility, and it is that view, or that phase of education, which I have in mind in this brief paper.

The most evident and plainest example of the present lack of such responsibility is to be found in the present day custom of discharging raw sewage into the stream nearest at hand. A selfish, inconsiderate community, struggling out of barbarism, might so disregard the effect of this practice, both upon the river itself and on other cities located down stream upon its bank, but to-day, when no city can help but have a full knowledge of the consequences of such practice, one must feel that, however much civilization has advanced in other directions, here, and in so far as this practice is concerned, such a city is not far removed from its original barbarism.

To awaken a sense of unselfishness, to arouse an appreciation of the rights of individuals and of communities, that is the education of the municipality in sanitary matters. And because the barbaric man is forced to be selfish, it is evident that such sanitary education as the writer has in mind is useless, and worse than useless, except in a community and with individuals who have passed out of barbarism and with whom civilization is more than a name.

This education must be directed toward three separate and distinct classes of citizens, and because these three classes have different ideals, and are affected by different influences, the methods of education must be separately adapted to each class.

In the first class come the city officials, the mayor, the commissioner of public works, the city engineer, the comptroller, the president of the board of aldermen, the individual aldermen. These men are often interested in government only for the rewards of the government. Quite as often, however, they desire honestly to act for the best interests of the city, with a respectful deference to the wishes of their constituents. But they find it hard to forget the demands for lower taxes and to involve the municipality in any larger expense, because of vaguely understood dangers to health, is to them a political blunder. In most cases it is difficult to educate them directly or to persuade them by any unselfish, altruistic appeal. Unfortunately, it is generally idle to talk to them of equities involved in polluting a stream used by other riparian owners. They are affected only when a lawsuit is threatened or when one section of the city, refusing to stand odors and nuisances longer, makes itself heard in a way not to be misunderstood. Persuasion, compulsion, pressure, appeal, these and other words of the same sort may be used to describe the efforts to be expended on those in office, but such efforts are not educational.

The second class above referred to consists of those specially charged with the duty of preserving the public health—that is, the members of the local board of health and the health officer. Naturally, perhaps, it is assumed that this class, because of their appointment, has special qualifications; that these men represent the latest, most scientific, and at the same time most practical, advances in municipal sanitation and in public hygiene. If this were indeed so there would be no further education needed, since their actions would be so liberally conceived and so diplomatically executed in matters of public sanitation that the results of their actions would carry conviction even to doubters. Unfortunately, a board of health is usually chosen for other reasons than aptitude and fitness, and, the writer fears, often includes men selected to represent offensive trades, and unmistakable nuisances, so that nuisances, as it were, might be represented on the board of health. The writer has noticed, for example, that it is common to appoint a butcher on the board of health, apparently so that the slaughter-house men might not be dealt with without representation. Similarly, a milk dealer is often appointed, in order that the dairies may not be too severely dealt with. The result often is that the butcher agrees not to be hard on the dairies if the dairymen will avoid drastic measures toward the slaughter houses. This is, of course, all wrong, and while self-interest will usually prevent any education of these

partisans, they may be led by an appeal to duty to take proper action on the subject, if there be such, in which no member of the board is interested. In case this pessimistic weighing of the personnel of the local board of health is not true, and the members have no axes to grind, their failure to carry out measures for the improvement of public health is due chiefly to ignorance, in which case educational efforts are well expended.

Ignorance of this kind may be divided into two classes: ignorance of the principles involved and ignorance of the state of the art in other cities, and the education must be of the two corresponding classes. The writer is inclined to think that the education of a health board is most effective when it succeeds in showing them what other cities in advance of their own in health matters have done to secure better health conditions. An example of this sort occurs when a city has put up with an offensive garbage dump for years, when the health officer has had complaint after complaint from the residents in the vicinity, and when each time it has been dismissed by the local board because "no other method of disposal is known or is within our means." When, however, some member of the local board, or, it may be, some citizen, finds out that some other city, no larger than his own, has built a garbage crematory almost in the center of the city, that it is operated at a reasonable cost, and that the problem of disposing of garbage has been solved, a wave of education rolls up which no amount of argument in the abstract could produce.

Or, again, if one city has such a poor water supply that a high typhoid fever death rate is maintained, year after year, and nothing is done, because, forsooth, there is no other water supply available, a visit to a neighboring city with an even worse source, but where purification of polluted water is practiced, accomplishes more than pages of printed matter on the subject of the typhoid bacillus or the hygienic efficiency of filters.

But it is to the education of the third class that the hope of the city in matters of municipal sanitation turns, namely, in the mass of the people themselves. We have for a long time been learning to distinguish between personal and environmental hygiene, between constitutional diseases and epidemic diseases. It is not very long since all disease was thought to be providential, and to attempt to avert sickness was to fight even against God. As we emerge from this condition into civilization, which has learned to appreciate diseases at their true value, a sharp distinction is made between those diseases for which an individual or a community is directly responsible and those due to inherited tendencies, and therefore outside one's volition. We must still submit to the ravages of diseases of the kidneys and of the liver because the self-control of the individual or his inherited constitution is too weak to resist attacks upon those organs. But other diseases may be eliminated if the public will only insist upon the proper precautions. And the public will insist just as soon as they know what to demand and the reasonableness of such demands.

How long, for example, could the citizens of a city be made to drink polluted water if they appreciated the consequences of the pollution and insisted on an improved supply? How long could a health board remain inactive if one or two wards of a city, suffering from a foul garbage dump in their vicinity, and knowing the dangers to be feared from decomposing organic matter, peremptorily demanded relief? How long before stables and dairies would all be modernized instead of the few at present, if mothers insisted on having clean milk for their children, instead of, as at present, taking anything that the milkmen choose to bring? And when such a sense of individual need and equalities is awakened, how long before it would extend to include a proper altruistic attitude on the part of one community towards another?

To the writer, since America is proverbially the "Land of the Free," and since adult Americans to-day are very impatient under laws which often seem to them to be arbitrary when their own individual actions are interfered with, even though such interference tends to prolong the lives of their neighbors, the hope of the country in sanitary matters is with the children. If the next generation can grow up with such a dread of poisoning water, air or food as has recently been aroused of dishonoring our flag, then will municipal sanitation have advanced to a point where discussion will be held over methods rather than over any question of the need of this or that sanitary regulation or improvement. Unfortunately, to-day, no instruction is given in this most important element of good citizenship. The schools go far to add to their curriculum courses in this fad or that fancy, but courses in public hygiene, teach-

ing the future citizen how to live and care for his own, so that he may not injuriously affect his neighbor, are not included. And yet this is where municipal education could be most effectively carried on.

To the citizen, then, whether present or prospective, must education be directed, first that he may realize his own present indignities, and then that he may be aroused to demand that same protection from nuisances and diseases that he expects from the police and fire departments of every well-ordered city.

---

# STORM DRAINAGE AT STREET INTERSECTIONS.*

*By J. Heiskell Weatherford, City Engineer, Memphis, Tenn.*

IN the absence of storm sewers, there arises the question of handling storm water at street intersections. This subject has to me two angles from which it may be viewed in addition to the main object, drainage, the first being convenience of vehicle traffic, and the second the convenience of foot traffic.

The first of these requires simply that vehicles may be able to cross the drain without undue increase in effort, without bumping and without twisting of the vehicle when a corner is turned.

As long as the horse-drawn vehicle was the only one, the question was hardly serious, but with the advent of the swiftly moving auto the subject became more acute. Even at that, where grades are slight, the open gutter may be used on all except the most important streets. When, however, one street approaches another on a steep descending rate, an open gutter becomes almost an impossibility. In a great many cases, however, if the gutter is of proper cross-section, the inconvenience to vehicles is not worth the cost of making a change.

If, however, the design be incorrect, the inconvenience caused is serious, and the crossings are even dangerous. It is possible, though, where only a small amount of drainage is to be handled, to design these open drains so that they do not inconvenience vehicles or pedestrians, and this phase of the subject is one well worthy of study.

When, however, the convenience of the foot public requires it, or some obstruction, such as street car tracks, prevents the use of the open gutter, a covered drain of some type becomes necessary.

Of these covered type drains there are in use in the city of Memphis two different types—one simply a covering for the gutter and placed entirely in the street with approaches in the intersecting street, and the other a drain under the sidewalk which diverts the flow of the water out of the path of the gutter under the sidewalk and discharges same from under the sidewalk into the gutter on the further side of the intersecting street, which latter drain we designate as a concealed drain.

Of each of these drains there are two modifications; one in which the street having a slight fall and being without obstruction, the grade of the gutter is carried practically undisturbed; and the other, one in which the street along which the drain flows is crossed by a car track or has a stiff grade or a break in a grade from a flat to a stiff grade at the intersecting street.

Taking up the first type of drain in which the gutter is covered, we have a comparatively simple problem; a flat bottom is built of brick or concrete, and two side walls are extended upward from same and covered with iron plates. It, however, possesses a great disadvantage in that the street is necessarily narrowed at the intersection, at which point it should be widest. However, if the drain is extended on each side of the intersection this loss of width can be thrown entirely in the street itself, and the intersection be made full width. Plate I shows a typical view of this type of inlet.

It was to obviate this narrowing of the street that the concealed type of drain was designed by the writer, and study is being made of this plan in order to perfect it so that it may be used to a very large extent, if not exclusively, in future construction. Plates II and III show typical views of this type.

It is, of course, evident that where the street is wide the loss in street width on account of the simpler type

*A paper before the American Society of Municipal Improvements.

may not be necessarily so serious, there being many places in which it may legitimately be used. Where the sidewalk is wide enough, also the curb may be set back at the intersection and the sidewalk narrowed, thus bringing the drain partially in the sidewalk space, and giving correspondingly less obstruction and narrowing of the street. This type is shown in Plate IV.

Where there is only a small amount of drainage entering the box from the intersecting street, it has been the practice not to use any plate at all on the street carrying such small amount of water; a short curb only being used to protect the paving where it comes against the iron plate. Such a construction is shown in Plate I, where the street intersecting the flow of the drain is not provided with a cover.

straight type. They may also require the use of special shaped plates in some cases, as well as the use of a special size of rectangular plates. This type is that shown in Plate II.

When, however, streets are improved which are beyond the conduit district, and wire service poles must be used at street intersections, the construction becomes more difficult in that the drain must go behind the poles, and the water way is necessarily made with more angles, is longer, gives more chances for obstructions and for filling up, and is necessarily more expensive to construct and clean. This type is shown by Plate III.

The space that the drain is set back from the curb is necessarily about thirty inches, when the thickness of curb and size of pole is allowed for.

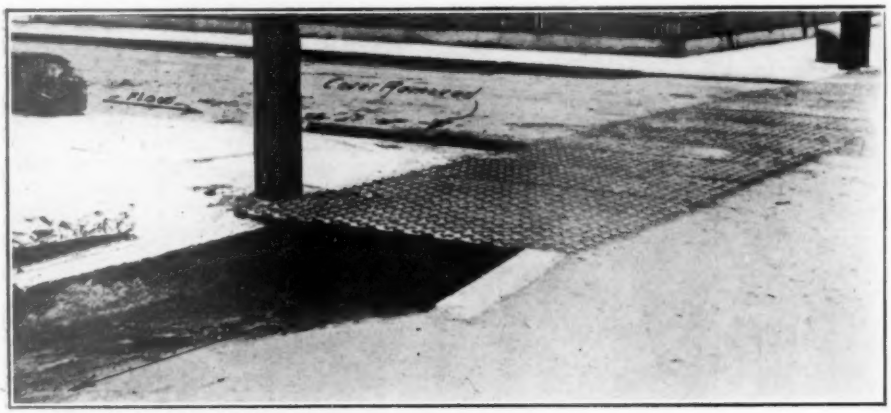



PLATE I. STREET DRAINAGE OF MEMPHIS, TENN.
Outlet End of Drain at Washington Ave. and Landerdale St.

It will be noted in each case where the drain is entirely or partially in the street that a similar length of curb extends beyond the drain covered by the plates, and that the short pieces of curb slope upward from the gutter grade to the grade of the iron plate.

The first of these types has been used almost exclusively in the city of Memphis up to the present time, but because of the loss of the street width before mentioned, the concealed type has been developed instead. This latter type is simple and easy of construction where conduits are used for wires and there are no poles to interfere with the work. In such places this can be built at the same or even less cost than the straight type, except that they do not lend themselves so readily to standard construction, the plates for them not being so readily made interchangeable as in the

GRADES.

First. Where no obstruction exists and the grade is continuous, that is, where no change of grade exists at the intersecting street, the bottom of the drain has the same grade that the gutter would have had, irrespective of whether it be the straight or the concealed type.

Second. Where no obstruction exists, but a change of grade occurs from a light to a heavy grade, the drain is made to take advantage of such change and additional depth is secured under the intersecting street.

Third. Where obstructions, such as car tracks, exist, the grade is worked out to secure the best obtainable grade with the shortest length of box possible. Where good grades exist this is comparatively an easy matter, but with

flat grades, say those of one-half of 1 per cent. or less, the situation is costly and impossible except for the concealed type, and storm sewers become necessary, unless (and such things have been done) the obstructing car track be raised and the bottom of the drain be continued without depression.

In all cases, however, the greatest care must be taken to make as few breaks in grade as possible. The profiles shown are open to criticism in that respect, it being preferable in that respect, in my opinion, to make all the drop at the mouth of the inlet, and to then carry the grade straight to the outlet.

Although not shown in any of the drawings, the iron plates in the drains, as far as possible, where they are very thick, are slightly raised, so that they come as much as one inch or one and one-half inch above the natural grade of the street, and the paving is brought up to them at such places; that being necessary in order to get the maximum drainage area of the box.

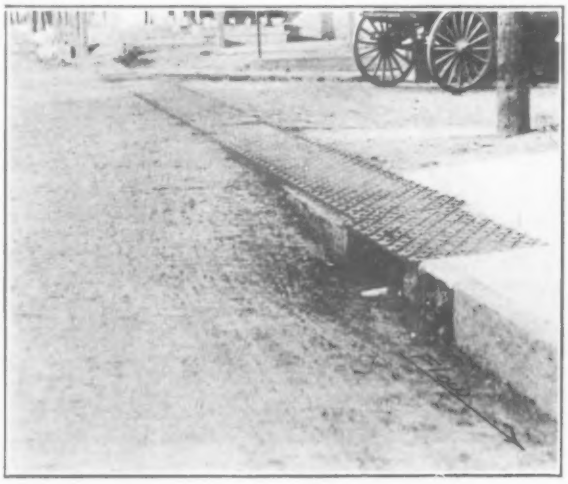


PLATE II. STREET DRAINAGE OF MEMPHIS, TENN.
Outlet End of Drain Under Sidewalk at Florida St. and Iowa Ave.

CONSTRUCTION.

The boxes, as ordinarily constructed, are made of brick or concrete, of rectangular construction, with 4 to 6-inch flat bottoms and 4 or 8-inch sides where brick are used, and with 6-inch sides where concrete is used.

For the shallow boxes close-fitting cast iron plates are placed as a top, any one or all of which can be removed. These plates are made of varying thickness, according to the span, as determined by the width of the box necessary to carry the water, and are made ordinarily from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches thick, and are of a standard size. The top is checked with a heavy check which gives foothold for horses, and as the center plates wear smooth they are changed to the sides until all are worn too smooth for further use, when they are sold as scrap.

Where the concealed type of box is used the sidewalk plates are made lighter, with a smooth check, but where the cover is entirely within the street the plates are of the same heavy type so as to be interchangeable with those taking the traffic.

Where depth will permit, however, the iron plates are eliminated as far as possible and a reinforced concrete slab is substituted. In the sidewalk portion of the concealed type this forms a part of the granolithic sidewalk, and differs very slightly from same in appearance, being necessarily reinforced at right angles to the length of the box. In the street proper a similar reinforced slab is used, and this forms the foundation, which is then ordinarily covered with the same class of street paving as used in the other portion of the street, though in many cases the concrete itself should be used as foundation. These concrete slabs, however, are not ordinarily removable, and for that reason at each side one iron plate is used, which plate is made removable, so that in case of necessity

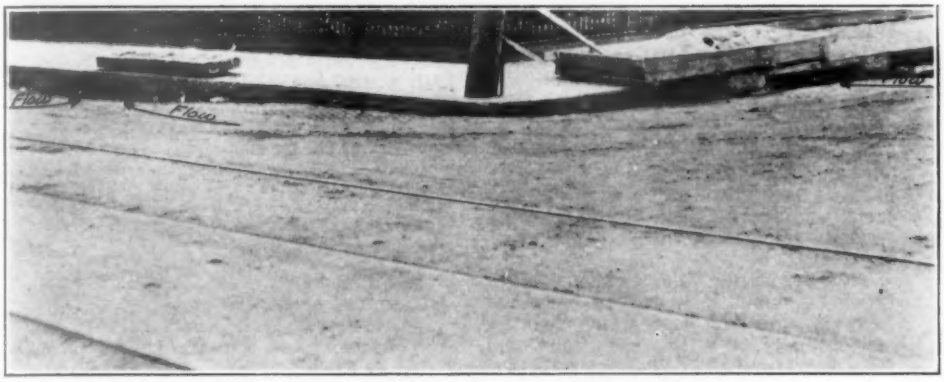



PLATE III. STREET DRAINAGE OF MEMPHIS, TENN.
Type of Concealed Drain. Inlets at Madison Ave. and Orleans St.

PLATE IV. STREET DRAINAGE OF MEMPHIS, TENN.
Outlet End of Drain at Calhoun Ave. and Third St.

it is possible to raise same to get at and clean the drain. For inspection and ordinary cleaning a light manhole rim and cover is placed in the sidewalk, where it is subject to light travel only.

CLEANING.

Drains of the types shown choke up often; and, especially where angles occur or grades change, are extremely hard to keep clean. The wide flat bottoms, too, are far from a self-cleaning section, so that frequent cleaning is necessary.

This is readily done in the straight types by flushing or in bad cases by removing the iron covers and cleaning mechanically. With the concealed type, however, when flushing fails, the problem is more difficult; however, by the intelligent placing of inlets in the sidewalk and the use of removable iron plates, this has to a large extent been remedied. I regret, however, that the cost of such cleaning has never been separated from other cleaning cost, and no data are available to compare same with inlet cleaning of storm sewers. It is also regrettable to note that even the street sweepers seem to think these drains a suitable place for paper and other refuse.

COST.

The cost of these drain covers varies, of course, very widely according to the amount of water that they carry. It also varies surprisingly according to the grade of the street and the consequent change in the construction made possible by heavy grades.

The principal item of cost is the iron cover. Where this gets five feet wide, which is the size necessary for a four foot box, the thickness and size begin to make the construction prohibitive.

With the narrow box the thickness of the plate decreases rapidly, and the size also decreases, and the cost is not so alarming.

Taking a typical drain of 4-foot span, 8 inches deep on a 60-foot street, and providing that the covers on the intersecting street go back 10 feet on each side, the cost of the different types of boxes will run as follows:

*Straight type*, flat grade, all cast iron cover plates:

| | |
|---|---|
| Excavation, 20 cu. yds..... | $10.00 |
| Concrete, 253 cu. ft., @ 20c per cu. yd..... | 50.60 |
| Iron plates, 80 ft. x 5 ft. = 32,000 lbs., @ $1.65..... | 528.00 |
| | $588.60 |

*Straight type*, steep grade, where say 30 feet can be built of concrete, these figures become:

| | |
|---|---|
| Excavation, 30 cu. yds..... | $15.00 |
| Concrete bottom and sides..... | 50.60 |
| Iron plates, 50 ft. x 5 ft. = 20,000 lbs., @ $1.65..... | 330.00 |
| Concrete slab, 30 ft. x 5 ½ ft., = 75 cu. ft., @ 40c..... | 30.00 |
| | $425.60 |

*Concealed type*, concrete slabs and iron plates as follows:

| | |
|---|---|
| Excavation, 34 cu. yds..... | $17.00 |
| Bottom and sides, 380 cu. ft. @ 20c. ..... | 76.00 |
| Iron plates, 10 ft. x 5 ft., 4,000 lbs. @ $1.65..... | 66.00 |
| Iron plates, 20 ft. x 5 ft., 4,000 lbs. @ $1.65..... | 66.00 |
| Sidewalk slabs, 60 ft. x 5 ft. x 4 in., 300 sq. ft @ 20c..... | 60.00 |
| Foundation slabs, 30 ft. x 5 ft. x 6 in., 150 sq. ft. @ 20c..... | 30.00 |
| | $315.00 |

*Concealed type*, all iron plates as follows:

| | |
|---|---|
| Excavation, 30 cu. yds..... | $15.00 |
| Bottoms and sides, 360 cu. ft. @ 20c. ..... | 72.00 |
| Iron plates, heavy, 40 ft. x 5 ft., 16,000 lbs. @ $1.65..... | 264.00 |
| Iron plates, light, 80 ft. x 5 ft., 16,000 lbs. @ $1.65..... | 264.00 |
| | $615.00 |

In addition the street railway company, where they are so unfortunate as to cross such a drain, are required to pay for that portion beneath their tracks and two feet outside thereof, amounting for single track to seven feet and for double track ordinarily to nineteen feet.

The area of such a drain is 8 inches by 4 feet, equivalent to 2¾ square feet, which is, neglecting friction, equal to a 22-inch pipe, or, taking it into account, is equivalent to a 20-inch pipe.

It will therefore be possible to build a block of storm sewer of approximately the same size for about what the more expensive of the crossings would cost, and on new construction, form and not over four hundred (400) where there is no paving to interfere with the construction of the storm sewer, and where the blocks are unifeet apart, there are many cases where these should be abandoned and the storm sewer put in purely as a matter of first cost. On the other extreme, small drains, such as those requiring

an opening of 8x12 inches, can be built for from $75 to $100 each, and other sizes will range, of course, between, so that, after all is said, much can be done to alleviate bad situations without ruinous cost where conditions make storm sewers more than usually costly.

In conclusion, it is well to note that iron covers, where exposed to traffic, seem to wear out as if by magic, and it is well, wherever same may be possible, on the score of maintenance as well as first cost, to substitute concrete for iron.

---

# CREOSOTE OIL FOR WOOD BLOCK PAVEMENTS.*

*By James Nisbet Hazlehurst, Consulting Engineer, Atlanta, Ga.*

IN spite of the complaint of deforestation and increasing demand and high prices for all wood materials, the call for wooden block pavements has grown continuously. It is generally recognized at present that this material, when properly treated and laid, shows so many advantages and so few of the disadvantages of other types of modern paving materials as to grow in popular favor, despite increased cost.

As has been demonstrated by many different kinds of wood pavement in the past, only those capable of resisting the effects of moisture and sawn into blocks suitable for being laid closely together, have shown superior lasting and satisfactory qualities under traffic conditions. Since the pores of the wood are alternately subjected to heat and moisture, without proper treatment the wood pavement tends to absorb large quantities of water after drying, the result being a buckle or bulge of the surface when the blocks are laid in contact.

As has been long known, the dead oil of coal tar, commercially known as "creosote oil," is the best antiseptic and preservative of wood fiber. Commencing with the simple dipping of the blocks in this oil, the process of treatment has gradually continued to the present time when it is recommended, in the best practice, that at least twenty pounds of oil should be injected under pressure into each cubic foot of the wood. Not only is it necessary that the fibers of the wood should be entirely filled with this oil at the time of treatment, but the necessity and importance of maintaining the oil in the wood after impregnation and to continue during the life expectancy of the block is well recognized as a prime necessity. Not only should the pores of the wood be filled to saturation, but the oil itself must be of proper quality, otherwise it is not a fixity and escapes by volatilization after a short exposure under normal conditions.

In a case which came under the writer's observation, blocks were treated at the works under the direction of a capable inspector, and were known to have absorbed twenty pounds of oil as required under the specifications. These blocks were loaded in box cars during the hottest portion of the summer months and were shipped to a point three hundred miles distant. On arrival it was found that a large percentage of the oil had volatilized under the heat in transit, and the blocks had lost weight to a considerable extent. As is generally known, the ordinary commercial creosote oil, when placed in a saucer and exposed to summer temperature even in the ordinary office, will vaporize and lose volume and weight.

It is, therefore, to be inferred that oil intended for paving purposes and to be subjected to atmospheric conditions and variable temperatures, should be distilled to a point where the essential oils will have largely passed off, leaving as a residue an oil of heavy gravity and density.

Some little time since, the writer prepared specifications for wood block pavement as follows:

Creosote Oil.—The paving oil shall be a heavy creosote product whose specific gravity shall not be less than one and twelve one-hundredths (1.12) at 68 degrees F., with the thermometer suspended above the oil, and not more than 40 per cent. shall distill below 600 degrees F.; the specific gravity of the residue obtained by distilling the oil up to 600 degrees F. shall not be less than one and fifteen one-hundredths (1.15). The oil must be devoid of carbon and absolutely soluble in benzol.

At the time of the letting, numerous

*A paper before the American Society of Municipal Improvements.

manufacturers of paving blocks and creosoting works were present, and while several well-known contractors stated their willingness to bid under the specifications, there were others who declined to do so, on the ground that the oil required was not a commercial product and that the specifications could not be complied with.

As it happened, alternate bids for other materials were received under this contract, and the award was finally made for a vitrified brick pavement, thus eliminating the question as to the ability of the contractor to furnish an oil complying with the requirements.

Being, however, desirous of ascer-

J. N. HAZLEHURST, ATLANTA, GA.

taining the truth of this matter, considerable correspondence followed with those best authorized to express an opinion. One of the largest creosote companies, when requested to criticise these specifications, after offering numerous objections, finally and lastly gave as their opinion that the specifications were objectionable "as impossible of fulfillment," reminding the writer of the old story of the sea captain who gave thirteen reasons why he was unable to fire a salute, the last being that "he had no powder."

The investigation in connection with this matter was taken up not only with manufacturers and dealers, but with chemists of recognized standing, some of them representing large corporations engaged in the manufacture of creosote oil directly or as a by-product. From these the general consensus of opinion was that a pure creosote does not have a specific gravity as high as 1.12 and always yields on distillation something more than 40 per cent. below 600 degrees F. Further, that the requirement that oil of this gravity must be free or devoid of carbon and absolutely soluble in benzol was an inconsistency and impossible of fulfillment.

This matter was also taken up and discussed with engineers of experience, some of them of high official standing, whose specifications were very nearly identical with those quoted and as used by the writer. One of these replied:

"I inclose herewith a copy of our specifications that refers to this particular part, and you will see that they are practically the same as yours. These specifications have given good results, and I am satisfied if they are carried out a good pavement will be secured. I think the oil of the gravity can be obtained, although I am inclined to think that on account of some commercial arrangements, it is practically all furnished in the East by one party. Experiments made with blocks treated with this heavy oil and with the heavy and light oils also make me feel sure that this heavy oil is a good thing and much better than the light."

With this conclusion the writer had every reason to concur, but the proposition was to get a good creosote oil of this gravity, commercially procurable, and which would permit free and open competition between contractors.

A chemist of a concern handling large quantities of creosote oil expresses himself as follows:

"It would seem to me that for the best creosoting oil an approximate specific gravity of 1.12 is too high. For a great many of the creosote oils a specific gravity of 1.12 would indicate that tar was present. If the tar was dissolved to a great extent it would not be soluble in benzol and some of the oil would not be dissolved. We know that some of the companies are using an oil mixed with tar, 10 per cent. being a frequent occurrence.

Another chemist advises in connection with these specifications that:

"By the very nature of the manufacture of creosote oil, no matter where made, no creosote oil can be obtained which will meet the demands of the specifications to the letter. The temperature employed in the distillation of

coal is such that some of the higher hydrocarbons will be split with the deposition of more or less carbon, and so modify the other hydrocarbons as to render them more or less insoluble in benzol, though still soluble in their mother fluid."

This chemist furnished an analysis of a sample of creosote oil submitted, as follows:

Specific gravity at 68° F..... 1.122
Distillate below 600° F.....39.00%
Specific gravity of residue at 140° F..... 1.265
Residue insoluble in benzol.... 1.81%
Free carbon.....minute trace

Ninety-four per cent. of the residue insoluble in benzol consisted of hydrocarbons.

The same chemist further remarks that specifications requiring a creosote oil of a gravity as high as 1.12 at 68 degrees F. should be modified. While it is believed that laboratory experiments of high distillation or filtration might produce an oil of this gravity practically free of carbon and with residue entirely soluble in benzol, it appears to the writer a certainty that such an oil is impossible of procurement commercially, and, as a practical proposition, should not be specified or demanded. Also, that the heavy bodied oil indicated is most desirable for paving purposes, that such an oil does not volatilize to an appreciable extent and is fixed in the wood, that the tar necessary to bring this oil up to the gravity indicated is not objectionable and that the small amount of free carbon present would not interfere with the penetration.

Hence the following is offered as an amendment to the original specifications:

CREOSOTE OIL.

The oil shall be a pure coal tar product, completely liquid at sixty-eight (68°) degrees F. and showing no deposit at this temperature.

Its specific gravity shall be at least 1.12 and the oil at 68° F. shall not contain an excess of two and one-half per cent. (2½%) of matter insoluble in benzol.

With the thermometer suspended above the oil, not more than forty (40%) per cent. shall distill below 600° F.

It is believed that while the above specifications are susceptible to considerable refinement and elaboration, they might be taken to fairly represent a product commercially procurable and which would answer all modern requirements. These specifications would be free from inconsistencies and the objections urged to those as originally used by the writer and largely employed by other engineers, and the suggestions are offered to this end and to promote a discussion which may prove profitable to those having such problems to solve.

---

# THREE YEARS OF EXPERIENCE WITH OILING ROADS.*

*By Frederic A. Reimer, City Engineer, East Orange, N. J.*

THE serious problem of the maintenance of telford and macadam roads forced upon us by the development of auto traffic is one of the vexed questions of the day, which demands a solution from us or further construction of this type of road must cease. A residential city, which till recent date could boast of its beautifully maintained roads, faces to-day an entirely different situation that calls for close study and thought if these roads are still to be considered as one of its principal assets.

The statement that these roads are being seriously damaged almost to the point of destruction by automobiles cannot be successfully challenged. The annual cost of maintenance has advanced far beyond what should be the yearly increase due to the normal increase of traffic, proving that the evolution of the motor-driven vehicle is the cause of this excessive cost.

While the commercial side of the question interests us principally, quite as imperative is the abatement of the dust nuisance when considered from the viewpoint of public health. I consider it incumbent on all street departments to cooperate in every possible way with the health authorities to effect an improved condition of our highways. Pure air, the chief agent of life and health, when impregnated with the dangerous ingredients that

*A paper before the American Society of Municipal Improvements.

are scattered broadcast through our streets, into our places of business and homes, becomes one of the most active agents for the breeding of diseases that each year swell the mortality reports of our health boards.

We have in East Orange fifty-seven miles of improved roads, all telford pavement. The questions that are constantly being asked are: What can be done to overcome the destructive effect of automobiles on our roads? Can our roads be preserved without prohibitive cost? Can they be made dustless? After careful study and investigation we determined to experiment with an asphaltum oil, believing it to be most adaptable for the solution of these questions.

Late in 1906 we carefully resurfaced one of our principal residential streets. In June, 1907, the road was thoroughly hand swept of all dirt and dust, leaving the road-metal exposed. We then applied an oil containing about 60 per cent. of asphaltum, a gallon covering two and one-quarter square yards. The oil was well swept in and allowed to penetrate, harden and dry, and the road was then opened to traffic. It had the appearance of a newly constructed asphalt road, perfectly smooth, but plastic enough to show slight tracks of vehicles. All stones were firmly cemented together to depths of three-quarters of an inch to one and one-half inches. As the season advanced the surface improved under traffic. The dust was eliminated, and in rainy weather the road stayed hard, dry and free from mud. This condition prevailed for a period of ten months before the road showed appreciable signs of wear. Prior to the oil treatment twelve cubic yards of sweepings were taken from this road every two weeks, and after the treatment there was not more than four and one-half cubic yards removed in the same period, making a saving of about 62 per cent. in the wearing surface of the road. In a period of ten months this meant the saving of about three-quarters of an inch of the road wearing surface. The cost of resurfacing this road every four years would be about 27 cents per square yard, during which time the road would be either dusty or muddy, and uneven. The oil treatment cost 5½ cents per square yard.

We treated this road again in 1908 with an oil supposedly of the same quality as that applied in 1907, at a cost of about 4½ cents per square yard. The oil proved to be of an entirely different character, and as nearly as could be determined contained paraffin to such an extent that there was but little binding quality. At each rain the oil emulsified, and the surface of the road would grind up into a thick, black, greasy mud, leaving the road in a deplorable condition. The covering of the oil with sand, thus avoiding the necessity of closing the streets, was tried, but the sand with the poor oil tended to disintegrate the surface so that it scaled off in large patches.

This year we have treated several miles of streets with a 65 per cent. asphaltum oil. The same preparation of the roads was made as before. The oil was applied in a similar manner, after which stone screenings were spread on to a depth of about one-half an inch and thoroughly rolled. The first results promised to equal the experiment of 1907. The roads were hard and smooth within a few days after being treated, but at the first rain they were in the same condition as in 1908, the cause, I believe, being solely in the quality of the oil used, and not in the method tried. Despite these unsatisfactory results, there has been some good derived from the use of these oils. While the road was in bad condition during rainy periods, it dried out and became hard and smooth and nearly dustless within a few hours after the rain ceased.

The use of a heavy grade of asphaltum oil as a binder in place of sand or clay has given fair results. On an old road a layer of four inches of 1¾-inch stone was spread and rolled to an even surface. The oil was heated to 150 degrees Fahrenheit, and then applied to the 1½-inch stone. One and eight-tenths gallon was used to the square yard at a cost of 10¾ cents. Stone screenings were then spread over the road and thorough rolled. Wherever the rolling brought the oil to the surface, screenings were added to take up the surplus oil. One objection which I have noticed in this road, which may develop into a serious one, is a tendency for the road to spread and creep under traffic. I consider it essential in surface treatment that the road be allowed to stand from four to six hours before putting on a covering of sand or screenings. The oil then has a chance to penetrate the hard surface of the road, so that when sand or screenings are added and rolled in, there is formed a bond with the old surface which is not obtainable otherwise. The percentage of asphaltic base in the oil to be used depends in a great measure on the road to be treated, and the traffic conditions also enter largely into determining this question.

I am of the opinion that the surface treatment with an oil having the proper quality and quantity of asphalt base will secure to us a resistant and resilient wearing surface which will withstand the traffic in residential suburban cities. The cost of this treatment would not exceed 5 cents per square yard per year. The elimination of the dust nuisance would be practically accomplished.

While I believe it is possible to successfully solve these questions by the method proposed, yet I am not indifferent to the uncertainty of success due to the possibility that the oils will not be of the same quality from year to year.

The solution, therefore, of this matter seems to depend more on the quality of the oil used than in the method of application. If we are to continue the use of asphaltum oils as the means to preserve and render dustless telford and macadam roads, careful attention and study must be made to determine just the quality of oil that will give us these results, and specifications should be so drawn as to insure securing the oil of the required quality.

---

# PUBLIC PARKS AND STREET TREES IN CITY PLANNING.*

*By William Solotaroff, Secretary of Shade Tree Commission, East Orange, N. J.*

IT is a well-known fact that cities are founded in certain particular localities on account of some commercial incentive. Any situation offering special advantages as a place where business men may conveniently meet or commodities may be cheaply manufactured or easily exchanged is likely to be occupied by a town or city. Places that are near to sources of natural wealth, at the mouths of navigable rivers, at falls or rapids of streams or at large and deep harbors are sites favorable for the location of large cities.

Whatever the reason may be that induces people to settle in a certain place, their first desire is to build shelters and homes in which to live. With this thought in mind, every natural feature of the land is swept away to make room for the city. As it grows there is an addition of square block to square block and a plan of the resulting city looks like a huge checkerboard.

Such, briefly, has been the history of the development of most of our cities. When this country was first settled the forest was regarded as an enemy to be vanquished rather than as a friend to be protected. The country seemed so vast and the natural resources so limitless that no one ever supposed there would come a time when we should be in danger of losing our natural heritage. When cities were built there was no attempt in most cases to set aside certain areas for park purposes or to conserve portions of the natural forest as playgrounds for the people. The cities of to-day show the lack of foresight of the original builders. At a meeting for the discussion of tree planting held in Fullerton Hall, Chicago, on January 31, 1909, Mr. Franklin MacVeagh, now Secretary of the Treasury, who presided, said that when he first saw Chicago it was a tree city. The trees were many and fine. Splendid trees were cut down over large areas where the city now stands. This statement would apply equally as well not only to Chicago, but a great many other cities.

With the development of society, acquisition of wealth, and increased culture through education and travel, there has come the recognition that cities must not only be the sites of manufacture and commerce, but attractive places in which one would enjoy to live. As a result, there is now a national movement for the preservation of places of natural beauty for the use of the public and the substitution of city squares and playgrounds for spots of wretched squalor and ugliness. This movement, which has secured marked headway in the last few years, has produced notable results. Extensive park systems in some cities are almost complete, and in others they are now developing.

The modern progressive and successful city possesses three assets: its in-

*A paper before the American Society of Municipal Improvements.

dustries, its commerce and its appearance. "Show me your city and I will tell you the kind and quality of your citizens," is a rule of universal application, invariably correct. The "morale" of a people is undoubtedly in exact keeping with the outward and manifest appearance of the municipal home. Municipal engineers must recognize that the modern city must develop not only along material lines, but also along esthetic lines; in the orderly and beautiful arrangement of its public domain, in the acquisition of land for public parks and in the planting of trees along its avenues and streets. The task of the municipal engineer in this city's attainment of the modern ideal is an important one. To be sure, a great many cities of the country have employed landscape architects to study out comprehensive plans for their improvement. Such places, however, are very few in comparison with the cities where the city engineer has charge of making the layouts of new streets as the town grows. The lack of foresight in providing areas to be used as parks and playgrounds is now being felt. The engineer should point the way and prevent the repetition of the mistakes of the past. As property grows higher the price of desirable sites becomes prohibitively high, and in time very little land remains available for park purposes.

The provision for the street tree has been a matter with which the city engineer has concerned himself very little. If we are to have trees on our streets, there must be a place where to set them. There should be a continuous parking strip provided, at least four feet in width, along which trees may be planted. If the width of the street permits it, these strips may be made up to ten feet or more, but a width of four feet is about the minimum space along which trees may be planted. Frequently no planting strip is provided at all, or it is made so narrow that it is impossible to set out trees.

The determining factor of the width of the roadway is the volume of vehicular traffic it carries. On the average street the width from fence line to fence nlie is divided into two-fifths for sidewalks and three-fifths for the roadway, so that a fifty-foot street would have a thirty-foot roadway and ten-foot sidewalks. The sidewalk width can be divided into a four-foot planting strip, four-foot walk and a two-foot sod space between the walk and the lot line. In some of the newer section of East Orange the streets were made sixty feet wide, and this width was divided into a roadway of thirty feet and sidewalks fifteen feet wide. A six-foot planting strip was provided. For the average residential street it is an ideal layout.

The roadway should not be made wider than is necessary for the volume of traffic. In the first place, it costs more to construct and maintain a wide road than a narrow one. The wider the road, the greater the volume of dust, and the closer the road comes to the sidewalk, the nearer the dust is to the pedestrians. A broad strip of turf between walk and curb enhances the beauty of the street, gives the trees a better chance for life and vigor, and gives to the houses a better setting.

These principles governing the determination of the widths of sidewalks and roadways are so simple that it seems strange that in some cities and towns the streets are laid out with no provision for trees, and the widths of the roadway and the sidewalks are not in proportion to the use of the highway. For example, in Carlisle, Pa., where I recently had the opportunity of making a survey of the trees, most of the streets are sixty feet wide. Although the street traffic is not extensive, the roadways are made forty feet wide and the sidewalks ten feet wide. As the houses are built rather close to the sidewalks, as soon as the trees become of considerable size the branches grow right against the buildings. As a result of such conditions, an ordinance was enacted in Carlisle requiring the setting of the trees in the gutter. It is evident that such a system of tree planting is very bad. Trees planted in the gutter become an obstruction to the highway; they prevent the running off of storm water and prevent the keeping of the roadways clean.

In laying out streets in newly developing sections of towns, city engineers are usually inclined to make the streets on the plan of rectangular intersections, with no provisions for any open spaces. Frequently, however, at little cost, small spaces may be utilized for park purposes. The triangular space at the place of meeting of two streets in a sharp angle may be planted with trees and shrubs. Irregularities in the street plans, such as street jogs or other failures of cross streets to make direct connections, can frequently be redeemed by the introduction of parking areas. These and other such opportunities should be availed of, for they are effective far

out of proportion to their area in making a town more beautiful. Such available spaces may either be public property, requiring no expenditure for land, or the enhancement of realty values by their use will be such as to make it worth while to give up a little land that would otherwise be used for building.

While the use of special areas for park purposes is admirable, the systematic planting and care of trees along the streets helps to make the entire city park-like. The *Savannah News*, in an editorial on February 10, 1909, said: "The increasing interest in shade trees in practically all of the cities of the country is worthy of more than a passing notice. This interest seems to be keeping abreast of the sanitary reforms that are being inaugurated. While it isn't stated that there is a connection between tree planting and hygienic reforms, there is no doubt that shade trees contribute to the healthfulness of a city. * * * The shade trees have a restful effect, because making homes more attractive. That which tends to give rest and pleasure must also contribute to healthfulness." Not only is the appreciation of the value of trees growing, but also the recognition of the fact that to secure the very best results, the planting and care of street trees must be done in a systematic way, and not left to the caprice of individuals.

The progress during the past year of the idea of the municipal control of shade trees has been marked. The movement, so successfully inaugurated by the legislative enactment of the State of New Jersey in 1893, has spread to other cities and states. In New Jersey there are now twenty-one cities that have shade tree commissions. The State of Pennsylvania passed a law in 1907 modeled after the New Jersey statute, providing for the planting and care of shade trees along the highways of the municipalities of that state. Wilkes-Barre and Ambridge have placed their street trees under the control of commissions, and the idea is spreading to other cities. The *Harrisburg Patriot*, in an editorial on January 2, 1909, said: "We do not see how any one * * * can doubt the wisdom of a speedy acceptance of the law of 1907, authorizing the placing of all shade trees in charge of a shade tree commission. The fine results obtained in East Orange and elsewhere * * * could never have been obtained by individual effort at any outlay of money. But it has been demonstrated in East Orange that it is less expensive to get and maintain a splendid, harmonious and beautiful system of shade trees, than it is to have such a haphazard arrangement as prevails in most cities where great possibilities are ruined, sometimes through indifference and inattention, but more often through ignorance."

During the past year I have been called to a number of cities to help in their campaigns for tree protection and the placing of trees under municipal control. Usually such movements are inaugurated by public spirited men and women and clubs who recognize the advantages of an orderly system of tree planting. Of the cities visited I will speak of Chicago and New Orleans as examples by which every city in the country might profit.

I was called to Chicago by the Chicago Woman's Club to speak at a meeting for the discussion of tree planting, which was held in Fullerton Hall on Sunday afternoon, January 31, 1909. Mr. Franklin MacVeagh presided. The other speakers were Dr. Stephen A. Forbes, the State Entomologist of Illinois, who spoke of the "Insect Enemies of Trees," and Mr. John O'Connor, who spoke of "Legislative Provisions in Illinois." The outcome of the meeting was the appointment of the Chicago tree committee, consisting of thirty prominent men and women. Mr. Franklin MacVeagh was made chairman of the committee.

While in Chicago, I had the opportunity of making a survey of the street trees, and all those familiar with Chicago will realize that the soil, the climate and the smoke combine to make the most adverse natural conditions for tree growth. Still, it was recognized that in order to get the best possible results, even with conditions as they were, it was necessary to have some public official or body with the duty of properly caring for and protecting the trees now existing or hereafter to be planted on the streets of that city. The efforts of the Chicago tree committee were directed with that end in view, and as a result of their labors the Chicago City Council passed an ordinance on March 22, 1909, placing the street trees under the control of the Special Park Commission of that city, and created the office of City Forester, which was filled in May. Chicago should be an example to every city in the country, for if with unfavorable natural conditions it is expected to accomplish great results through systematic efforts, then surely places

where trees will readily grow cannot afford to be backward in this form of municipal improvement.

After Chicago, the visit to New Orleans was a revelation. The conditions for tree growth there are unrivalled in the land. The layout of the streets is splendid. Most of them are a hundred feet or more wide, have parking strips six feet or more in width and many of them have a central strip about twenty feet wide for the planting of trees and shrubs. But what do we find? Owing to the fact that the planting of trees had been left to the individual property owner, there is the same lack of harmony and uniformity as in all other cities where the street planting is the task of each citizen. There are long stretches of street not planted at all, there is a mixture of species on the same street, some trees are pruned too high and the branches of others are left too low. The trees have been left unprotected from injury and there is evidence that they had been injured by insect pests.

The New Orleans Tree Society recognized that it was necessary for the city to assume absolute control over streets, from property line to property line, and allow no planting or trimming except by special permission. Under the auspices of the New Orleans Tree Society I had the honor of speaking at a meeting held in that city on February 4, 1909. The result of the meeting was an announcement that the mayor would call a conference of the park officials and others interested in tree planting.

The efforts of the New Orleans Tree Society bore satisfactory results. On May 5, 1909, the city council of New Orleans passed an ordinance creating a parking commission that would have exclusive control of the planting and care of shade trees. The sections of the ordinance of Chicago and New Orleans creating the tree departments were drawn largely after the statutes of New Jersey and Pennsylvania.

In a prospectus issued since its organization, the New Orleans Parking Commission beautifully defines its function and its mission as follows:

"If this commission diligently searches out its true relationships in the beautiful or fine arts, where it rightfully belongs and studiously possesses itself of that largeness of thought and trained facility of imagination, inspiring within itself the idealizing faculty, whereby the true architect and painter project visually the creations of genius before work is laid on drawing board or brush on canvas; then, of very necessity, as like begets like, there will begin throughout this city a development in pure art; dignified in orderly elegance and grace; beautiful in unity, becoming more apparent and impressive with each succeeding year, just as the Washington city of today was visually projected as a living painting, by l'Enfant a hundred years ago—and the city of Cleveland, with its newly projected grandeur by the chapter of the American Institute of Architects.

"To initiate this is the work we are called upon to do—a work that must be carefully mapped according to specifications in the general plan, in which every tree planted and dollar spent shall count just that much toward the end in view; which is the real and practical uplifting and betterment of the whole community, physically, mentally, morally, in the actual comfort and pleasure of living and in a growing sense of self-regard and civic pride. It is a home mission work in a strictly rational, business way, with certainty of returns, far exceeding expenditure; an enterprise rich in utility; not of a mechanical or directly commercial kind; for the city does not propose to open a wood yard or grow trees for lumber; but it does contemplate something far more useful in a beautifully environed, clean, wholesome, contented citizenship; for as the environment so are the people. If the one is slovenly and degraded, so is the other; and the contrary is true, as proved in every community; particularly in large manufacturing centers where the extremes of comparison are so distressingly in contrast."

As this convention is held in Little Rock I may take the opportunity to say to the people of the South that on account of the climate and great variety of native flora no section of the land offers greater opportunities for the embellishment of the home and the street than the southern states. With such material at hand as the live oak, the laurel oak, the magnolia grandiflora, the pecan, the hackberry, the cypress, the sweet gum, the tulip, the camphor tree, the crepe myrtle, the Japanese privet, the "Gloria Mundi" or wild peach and the palms, it is possible to obtain results that would not only be particularly southern but such as could not be surpassed in splendor elsewhere. It must be recognized, however, that no matter how favorable natural conditions are, the realization of the ideal street is possible only after careful planning and systematic improvement.

# CONCRETE IN WATER WORKS CONSTRUCTION.*

*By William Curtis Mabee, Construction Engineer, Water Company, Indianapolis, Ind.*

THE art of concrete construction dates back to ancient times. The Romans built their important structures of a concrete mixture composed of lime, sand, stone and volcanic dust, and the evidences of their activity in this art are standing to-day.

The modern art of cement making was not discovered until 1813, and it remained a secret until 1824, when its inventor, Joseph Aspdin, of Leeds, England, procured patents on Portland cement, so called because of its resemblance to a certain limestone quarried on the island of Portland, England. His process consisted of combining English chalk with river clay, drying the mixed paste and calcining at high temperatures. Portland cement was first imported into this country in 1865 and the first Portland cement was manufactured here in 1872. During recent years the development of the American Portland cement industry has been nothing short of marvelous, and its use is now almost universal. This progress has been possible simply because of its merits as a building material. Portland cement makes an ideal concrete, a perfect artificial stone.

The art of concrete construction has made rapid advances in every branch of engineering, and it is especially adapted to water works requirements. Concrete is durable, strong, sightly and sanitary, and its moderate cost enables it to supplant wood, brick and stone in many instances.

When used in combination with steel for reinforced concrete work, concrete makes a perfect preservative of the steel, preventing its destruction from corrosion. It will withstand exposure to steam, hot water, wet or dry air, sea water, sewer and furnace gases, without injury to the incased metal. Reinforced concrete is fire-resisting and practically earthquake-proof. The steel supplies the element of tensile strength lacking in the concrete itself.

Concrete has many advantages over other types of construction. It is easily and conveniently handled and transported, often at a less cost than stone masonry, and often suitable sand and gravel for the work in hand can be found on the site. With proper supervision, skilled labor is not essential in the usual work; then, again, the science of mixing and handling concrete has been so perfected that machines do most of the work. Concrete has the additional advantage over stone of being molded into intricate shapes.

To produce concrete surfaces of a satisfactory smoothness and uniformity it is necessasry that the molds be carefully and properly built, and also that the concrete be of the proper consistency to flow readily into the prepared molds, and it is also necessary to thoroughly churn and keep it in motion in the molds until the air has been removed and every crevice filled with mortar. Properly handled in this manner, it will not be necessary to brush or plaster the work after the removal of the forms.

Concrete may be placed in moderately freezing weather if proper precautions are taken to warm the gravel or stone and sand, to heat the water and to cover the work until initial set takes place.

The problem of preventing ugly cracks forming in concrete is one that has worried many engineers. Plain concrete is more than likely to crack where you least expect it, and it has become the practice to provide for these cracks by building short sections in alternate blocks; however, by the judicious introduction of steel bars, objectionable contraction cracks can be entirely eliminated.

The water works engineer or superintendent is particularly interested in the subject of water-proofing concrete. It has been shown that wet concrete is more dense and consequently more impervious than dry concrete, and that concrete becomes more or less porous as the quantity of cement is increased or diminished. A smoothly troweled surface produces a water-tight film or skin. It has also been found that slaked lime, added to the concrete mixture, helps to make it less permeable. The lime does not injure the cement in any way, although retarding the setting. Coal tar, pitch and asphalt mixtures, applied on concrete, are used with more or less success. A wash composed of one pound of lye, five pounds of alum and two gallons of water, applied with a brush and well rubbed in, has been used successfully

*A paper before the American Water Works Association.

on government fortifications. A rich cement mortar plastered over concrete makes a very good water-proofing medium. Proper attention to these details will produce a water-tight structure, if there is not likely to be contraction cracks, but in works of any magnitude these are bound to occur and can be best provided against by the introduction of steel bars. A rich concrete, properly reinforced, coated with plaster and troweled smooth, makes an ideal water-proof structure.

Experiments made on large reinforced concrete pipes by the United States Geological Survey, and intended to discharge under pressures up to 35 pounds per square inch, demonstrated the permeability of concrete and the practical value of different kinds of plasters, paints and washes. It was found that all of the tests made on washes or paints gave poor results. The conclusion drawn from these experiments was that the best results could be obtained by giving the inside of the pipe one coat of plaster one-half inch thick, composed of one part cement to one and one-half parts sand and a small quantity of lime paste, thoroughly cooled, to retard setting, keeping the pipe well wet ahead of the plastering, and when this coat, which is left rough, had dried, add another coat about one-quarter inch thick of plaster composed of one part cement to one part of sand. This coat should be troweled to a smooth surface, and when dry the entire inside surface of the pipe should be covered with a thick wash of cement and water. When the water pressures are not great and the concrete is sufficiently rich in cement, no plastering is necessary.

Concrete has found a wide field of usefulness in its application to water works, and, indeed, it would be extremely difficult to imagine a purification works built to-day in which concrete was not the principal building material, from the foundations to the superstructure. It is particularly adapted to the construction of water conduits and pipe lines, to tanks and basins, to water towers and standpipes, to reservoirs and clear wells and to filters, either slow or mechanical. Indeed, the present-day mechanical filters have been considerably modified by the adoption of concrete construction. The rectangular shape of the concrete mechanical filter is rapidly replacing the circular wooden or steel tank, as its use results in an economy of space.

Little Falls, N. J., was the first plant to adopt the rectangular tank and the general use of concrete throughout its purification system. This plant was built in 1901.

Engineer Wm. Wheeler, in 1885, built the first filters in this county having groined arch covering, at Ashland, Wis. He used brick piers and brick arches, backed with concrete, and in 1896 built two filters at Somersworth, N. H., with granite piers and brick arches backed with concrete.

In 1897, Freeman C. Coffin built a reservoir at Wellesley, Mass., having brick piers and all concrete arches.

Charles Hermany, in 1900, at Louisville, Ky., built his clear water reservoir, with groined arch vaulting of "concrete metal," and the piers of concrete 3.4 feet in diameter, having a span of 22 feet center to center of supports and a rise of 3.8 feet. The columns were 21 feet high, and made of Portland cement concrete.

About this same time John W. Hill, at Philadelphia, began the construction of its immense filtration system, using concrete exclusively for the filters.

The use of the concrete groined arch covering for reservoirs and filters is now quite general.

New Haven, Conn., under the direction of George W. Fuller, in 1904, was the first to depart from the groined arch type of cover for its filtration plant, adopting the reinforced concrete flat slab and beam construction, with reinforced concrete columns.

It has been the writer's privilege to be connected with the Indianapolis Water Company in the development of its purification system, involving pretty generally the use of concrete, and the following descriptions of these works are submitted, together with the several items of cost.

The filter plant is supplied by a gravity flow from the Indiana State Central canal, which was originally built by the State for transportation purposes, and later was purchased from the State by the company. The head gates and concrete sluiceways of this canal are located about six and one-half miles above the intake to the filters.

The canal is carried over Fall creek, near the filter plant, in an open aqueduct, at a height of 18 feet above said creek.

On March 26, 1904, a disastrous flood carried away the existing aqueduct, which was built of wood, supported by steel trusses on rubble masonry piers and abutments.

The aqueduct as rebuilt is a rein-

forced concrete structure, 300 feet long and 41 feet wide, having four skew segmental arches, each of 60 feet span, with a 10-foot rise from the springing line to the soffit, and a crown thickness of 18 inches. The height from the foundation courses to the towpath is 35 feet 9 inches.

The foundations for the piers, abutments and wing walls were carried down 16 feet below low water and rest upon a bed of sand and gravel.

The arch ring is reinforced with 8-inch steel I-beams, spaced 2 feet 6 inches on centers and bent to the curvature of the arch. Over the extrados of the main arches and in line with Fall creek are built small transverse arches, the purpose of which is to increase the discharging capacity of the bridge during freshets and to eliminate the possibility of freezing, which might occur with hollow spandrels.

Over these smaller arches was placed the trunk or aqueduct proper; this was constructed of a 9-inch concrete slab reinforced with steel rods extending into the side walls, which were 6 feet high and 2 feet 6 inches wide, with a projection of 2½ feet, supported by concrete brackets, making a walk or towpath 5 feet wide on the down stream and a series of notches or weirs on the up-stream side, to relieve the canal of surplus water. The trunk is 36 feet wide in the clear, with a depth of water in the channel of 5 feet. These side walls were built in short alternate sections and were connected by sheet-lead expansion joints. The lead sheet was about 20 inches wide and 6 feet long; it was folded lengthwise, with a convolution in the center of the sheet, and holes were punched in the sheet for anchorage in the adjoining sections. This expedient has proved entirely successful, the aqueduct having been in service now for four years, and no leaks have ever developed in the trunk, although contractions of the sections are evident during cold weather. This work was done during the winter of 1904-5.

The structure contains 4,500 cubic yards of concrete, mixed 1-2-4, the unit cost being as follows:

PER CUBIC YARD OF CONCRETE.

| | |
|---|---|
| Cement | $1.90 |
| Steel | .77 |
| Sand and gravel | .54 |
| Lumber | .90 |
| Form labor | 1.12 |
| Concrete labor | 1.29 |
| | $6.52 |

The filters, built in 1902, are of the slow sand type, covering 4.8 acres; they were originally built open and in three large units. It was found necessary to cover and divide them into six units, approximately 100x350 feet each.

Cast iron columns were selected for the supports in preference to concrete piers, to save time in the erection of the same and to minimize the disturbance of the filter material and pure water drainage system, which had been completed and in operation since September, 1904. No provision had been made for covers in the original plans.

The covers consist of 3-inch slabs, supported by concrete beams 19 feet 7 inches long, spaced 6 feet 9 inches on centers, the beams being 8 inches wide and 15 inches deep; these beams are, in turn, carried by 18-inch I-beams, incased in concrete and bolted to the columns, forming a continuous girder 22 inches deep, which is supported on cast iron columns 7 inches in diameter and spaced 20 feet 3 inches on centers.

The columns rest on cast iron base plates 15 inches square, laid on short piers.

These columns are filled with concrete and are kept painted outside with asphalt paint.

The excavation for the columns was accomplished by means of cylindrical sections of steel plate, which were easily driven down through the four feet of filtering material.

The partition walls are each 350 feet long, 14 to 17 feet high and 1 foot thick, reinforced in both faces vertically and longitudinally with ¾ and ½-inch bars, respectively. The slab reinforcing is ¼-inch bars spaced 3 inches on centers in the direction of load and 6 inches on centers in the opposite direction.

The beams are continuous over nineteen supports and the girders over eleven supports.

The entire slab, covering 70,000 square feet in each double filter, is built monolithic, without any attempt to provide expansion joints.

About the four sides there is a parapet wall for retaining a cinder filling and for closing the spaces between the beams. This wall is kept separate from the main supporting wall by a paraffine joint, the I-beams resting on rollers in the wall. The lubricated joint was provided to allow the cover to expand and contract freely without introducing bending into the main wall. These covers and walls are water-tight for all practical purposes.

In the removal of forms, from ten days to two weeks were allowed to elapse after placing the concrete.

The work was done with a cable

tramway spanning 450 feet, suspended from movable towers mounted on tracks, the concrete being handled from the mixer to the cableway by means of a shuttle car on a narrow-gauge track, propelled by a stationary engine and cable. In this way 80 cubic yards was an average day's work, covering 5,000 square feet of surface.

COST OF COVERS.

| | Per cu. yd. | Per sq. ft. |
|---|---|---|
| Reinforcing bars | $4.45 | $0.076 |
| Labor placing bars | 0.65 | 0.011 |
| I-beams | ... | 0.063 |
| Placing I-beams | ... | 0.003 |
| Sand and gravel | 0.75 | 0.013 |
| Cement | 1.85 | 0.031 |
| Placing concrete | 1.06 | 0.018 |
| Lumber for forms | 1.06 | 0.018 |
| Labor on forms | 3.52 | 0.060 |
| Columns | ... | 0.031 |
| Miscellaneous material and labor | 1.31 | 0.020 |
| | $14.65 | $0.344 |

Superintendence not included. The concrete was mixed 1-2-4.

COST OF WALLS.

| | Per cu. yd. | Per sq. ft. |
|---|---|---|
| Reinforcing bars | $3.05 | $0.113 |
| Placing bars | 0.76 | 0.028 |
| Sand and gravel | 0.75 | 0.028 |
| Cement | 1.61 | 0.060 |
| Placing concrete | 1.00 | 0.037 |
| Lumber for forms | 0.55 | 0.020 |
| Labor on forms | 2.98 | 0.110 |
| Miscellaneous | 1.36 | 0.051 |
| | $12.06 | $0.447 |

The 5,500,000 gallon pure water reservoir, built during the season of 1907, is near Fall creek, on a gravel foundation, at the ordinary ground water level. The groined arch bottom was designed to resist the upward thrust of extraordinary high ground water at such times that the reservoir is empty. The earth fill, 2 feet deep on the cover, and the weight of the structure itself would overbalance any upward pressure that might occur. The inverted groined arch construction also distributes this load uniformly over the bottom. The lower section of the arch is reinforced with ½-inch twisted bars, spaced 10 inches on centers in either direction, to bond the sections together and to prevent contraction cracks. The joints were brushed with cement grout in addition. No other water-proofing material was used, as under the low head of water carried, the amount of percolation through the concrete itself would be inconsiderable if cracks could be prevented.

The walls were 1 foot thick, securely anchored to the floor and cover, and were reinforced against side thrust in both faces and against longitudinal temperature stresses by bars. The wall was built monolithic about the four sides of the reservoir, the corners being rounded by curves. Nothing worse than a few fine hair cracks showed up, and these did not occur at the corners, as is usually the case.

The roof slab is 5 inches thick, reinforced with ⅜-inch rods, with variable spacing; this slab is supported by concrete beams 8 inches wide and 16 inches deep, which are carried by plain concrete columns 12 inches square, spaced 10 feet on centers.

The costs as follows do not include superintendence or office expenses:

COST PER 1,000 GALLONS STORED—$9.33.

| | Per sq. ft. of water surfaces. |
|---|---|
| Excavation (7-foot cut) | $0.08¼ |
| Refill on cover (2 feet) | 0.03 |
| Floor | 0.15¼ |
| Wall (distributed) | 0.04½ |
| Cover | 0.24½ |
| | $0.55½ |

| | Per sq. ft. of water surfaces. |
|---|---|
| Excavation by machinery and cars, 15,000 cu. yds. | $0.19 |
| Excavation by teams, 11,000 cu. yds. | 0.28 |
| Refill, 10,000 cu. yds. | 0.22 |

PLACING CONCRETE, PER CUBIC YARD.

| | |
|---|---|
| Floor | $0.76 |
| Walls | 0.61 |
| Cover | 0.74 |

COST OF BENDING AND PLACING BARS.

| | |
|---|---|
| Floor, 103 tons | $4.63 |
| Walls, 25 tons | 11.37 |
| Cover, 151 tons | 6.46 |

COST OF FORM LABOR PER SQUARE FOOT OF CONCRETE SURFACE MOLDED.

| | |
|---|---|
| In floor | $0.03 |
| In walls | 0.053 |
| In cover | 0.038 |

The concrete was mixed with a batch mixer, using a cableway for distributing same and a shutttle car to convey the concrete from the mixer to the cableway.

The gravel was taken from the excavation and was used unscreened and unwashed in the proportions of one part of cement to six of gravel.

The quantities involved were:

| | Per sq. ft. of water surfaces. |
|---|---|
| Concrete, cubic yards | 5,195 |
| Steel, tons | 283 |
| Cement, barrels | 6,300 |
| Gravel, cubic yards | 5,700 |
| Lumber, thousand feet | 210 |
| Excavation, cubic yards | 26,000 |
| Refill, cubic yards | 10,000 |

| | Per cubic yard of concrete. |
|---|---|
| Cement, barrels | 1.21 |
| Gravel, cubic yards | 1.10 |
| Steel, pounds | 1.09 |
| Lumber, board feet | .40 |

The greatest amount of concrete placed in one day of ten hours was 134 cubic yards, while the average amount for the concreting period was 70 cubic yards.

A reinforced concrete pipe line was built during the winter of 1907-08. It is 840 feet long and is used for the purpose of conveying raw water to the precipitation basins. It is laid 11 feet below the hydraulic gradient. The inside diameter is 66 inches and the concrete shell is 6 inches thick. It is reinforced with ½-inch twisted bars, spaced 8 inches on center in either direction. The pipe was built in three general operations after the ditch had been dug to dimensions corresponding to the outer circumference of the pipe.

A concrete cradle 30 inches wide was first laid to grade holding the lower circumferential rods, the rods being held in position by curb boards notched out to receive them, and also by the lower longitudinal rods. These lower circular rods were heated and bent in the field to the required shape and they were left long enough to project into the upper ring about 12 inches.

Semi-circular metal forms were then placed on this cradle and fastened down by timbers laid across the tops and staked into the side of the trench to prevent the forms from floating.

The concrete was mixed in the proportion of one of cement, two of sand and four of gravel, and was poured into the space between the side of the ditch and the metal form, this operation completing the lower half of the pipe; the metal forms were then inverted and supported on wooden roller bearings and wooden track. The upper rods were then fastened to the lower projecting rods and curved wooden forms were braced into position for molding the upper ring, leaving a space 18 inches wide open along the top for placing the concrete. It was kept well churned and produced a smooth and perfect piece of work.

To facilitate the setting, as this work was done during the cold weather, gasoline torches were burned inside the completed portion until the whole was completed, and the narrow exposed strip on top was protected by canvas. About one hundred feet of completed work a day was the usual progress, the metal forms being moved ahead in one-hundred-foot sections without disjointing. No cracks of any kind were discernible at the completion of the work, and the pipe is watertight.

The unit costs were as follows:

| | Per lineal foot of pipe. |
|---|---|
| Placing centering and forms | $0.958 |
| Rental of metal centers | 0.120 |
| Steel reinforcing bars | 1.054 |
| Labor placing bars | 0.258 |
| Cement | 0.674 |
| Placing concrete | 0.843 |
| Hauling materials, incling gravel | 0.251 |
| Engineering | 0.054 |
| Miscellaneous | 0.098 |
| | $4.45 |

The pipe contained altogether 300 cubic yards of concrete and the total cost was $12.46 per cubic yard.

The concrete was mixed in a batch mixer and wheeled an average distance of 500 feet.

Bids received on 60-in. light steel pipe proposed for this purpose, on board cars Indianapolis, ran from $6.70 to $7 a foot, one bid contemplating furnishing and laying in the ditch prepared by the company for $8.25 per foot.

Sixty-inch light-weight cast iron pipe would have cost $15.50 a foot f. o. b. Indianapolis, to which must be added the cost of lead and laying to make the costs comparative.

The cost of the concrete pipe did not include excavation, which would have been the same in either case, nor the cost of the gravel, which would add about 27 cents a foot; so that the reinforced concrete pipe cost about one-half as much as steel and about one-quarter as much as cast iron; in addition, it was 6 inches greater in diameter than either, besides having the advantage over steel of greater durability.

With the installation of the preliminary treating plant, it became necessary to know how much raw water was being treated with chemical, and at

the same time have the apparatus for recording and indicating these amounts at a convenient location to the operating headquarters. Accordingly a reinforced concrete Venturi meter, 42 inches in diameter, having a throat diameter of 21 inches, was built in the 42-inch raw-water conduit, and the indicating apparatus was placed in the laboratory building. The throat section was of cast iron and brass. The conical forms were made up by the planing mill and worked on perfect lines and dimensions.

The concrete was mixed in the proportions of one of cement, one and one-half of sand and three of gravel.

The meter was built in the fall of 1908 and has been in service now for several months, and is in every respect satisfactory.

The coagulation basin is a part of the general scheme for clarifying the raw river water by coagulation.

The baffle walls are 70 feet apart and are reinforced simply to prevent contraction cracks. The embankments are of earth sloping two on one, and are lined with a 4-inch slab of concrete, reinforced by ⅝-inch twisted rods, spaced 4 feet apart in either direction. The slab floor is 4 inches in thickness and was laid in alternate blocks 8 feet square. The floor slopes 1 foot in 35 to the open ditches, which, in turn, slope 0.2 foot to the 100.

Water pressure pipes are laid with hose connections built into the baffle walls, to facilitate the flushing out of sludge during cleaning periods. This portion of the precipitation basin was built during 1908 and went into service last November.

In connection with the coagulating basins and for the purpose of treating the raw water at seasons of excessive turbidity, there was built a chemical treating house. The lower part of the building is principally lime saturating tanks, over which are built the iron solution tanks.

The columns, floors, walls, stairways, roof and tanks are of reinforced concrete throughout.

The building is veneered with pressed brick and stone trimmings.

In connection with the iron solution tanks, it was observed that any tendency for water to percolate through the concrete was promptly checked as soon as the sulphate of iron solution was introduced.

All tanks were built monolithic as boxes, in one operation and independent of each other. This work was done during the first half of the year 1908, and the building is now in service. Mr. George W. Fuller, C. E., was consulted on this work.

These examples of concrete construction are given merely as an indication of how valuable this material has become, and illustrate in part the usefulness to which concrete can be put in the development of water works generally.

A ROADWAY THAT NEEDS IMPROVEMENT.

# EDITORIAL COMMENT

**The Latest Commission Form of City Government.**

**The Water Supply of the Panama Canal.**

## THE LATEST COMMISSION FORM OF CITY GOVERNMENT.

The city of Boston, Mass., on November 2 decided by popular vote to adopt the new plan of city government devised by that city after the investigation of methods and results made by the special finance commission whose report was published last summer.

The plan is a distinct improvement over the forms of city government, new and old, which have been under so much discussion for some years, in that it adopts most of the good features found in them and has rejected the more objectionable features.

The new Boston charter adopts from the Indianapolis charter provisions which have been in successful operation for nearly twenty years, which separate by a well defined line the administrative and legislative departments, and, as in Indianapolis, the mayor is wholly responsible for all appointments of administrative officers. The budget originates with him and is transmitted to the council by him instead of through his appointee, the comptroller, as in the earlier charter. And, again following Indianapolis, the council can reduce appropriations below those asked for in the budget, but cannot increase them. These provisions have marked advantages over the ordinary terms of the charters following the commission form. In the latter form there may be many candidates for the few commissionerships and it is impossible to select and insure the election of experts to manage the various administrative departments, and even if they happen to be elected it is still in the power of the commission to parcel out the departments according to some other plan than that of fitness for the offices. On the other hand, Boston selects its mayor from the list of candidates, because of his fitness for that office, and gives him the power and the responsibility for making appointments of experts to carry out his general policies in the most approved manner. The bargains, the misunderstandings, the jealousies which are beginning to arise in some of the cities acting under the commission form, show the unfortunate consequence of the division of responsibility among five or more heads of departments and of making the board which they compose at the same time the appropriating and the expending body. Indianapolis has shown by years of experience the value of the concentration of responsibility. There is no question of the location of the reason for error or dishonesty in its government. If it is found in any official or any number of officials the mayor can make the correction at once. If he does not do so he becomes personally responsible.

Boston has made one very important improvement over the Indianapolis plan by adopting the commission plan of selecting candidates by petition. Five thousand names on a petition make a man candidate for mayor or councilman without reference to his party affiliations. At least one excellent man was ruled out of the race for nominations for the recent Indianapolis election because neither party would accept him as representative and the party machinery was too strong to give any but the most extraordinary independent candidate any chance of success.

Indianapolis has long selected its candidates for school commissioner in the Boston way and has an object lesson at home of the efficacy of this method.

Indianapolis has tried for the first time a reduction in the number of councilmen to nine, but they were nom-

inated by parties rather than by petition and from districts rather than the city at large, although they were elected by the city at large. To insure minority representation there are only six districts, so that there were but six candidates from any one party although there were nine councilmen to be elected. The practical necessity for some prominence in party counsels in order to secure a nomination again reduced the quality of the timber offered and there is little if any improvement over the old ward councilmen. Boston improves on this by cutting loose from politics entirely, nominating by petition and electing by the city at large, thus adopting what is in fact the principal if not almost the only provision which has given the commission plan its successes. The city is a business corporation and not a political creation, and it should be operated on business principles.

Some of the minor provisions of the Boston charter promise well. Thus the councilmen serve three years and three are elected each year, thus retaining six men of experience and electing the new men in three years out of four without reference to the campaign for mayor, for he holds office four years, unless, prior to the expiration of his second year, a vote is taken at which a majority decides that a new mayor shall be elected at once. This is a form of recall which is self-operative and may not act as satisfactorily as the original form.

The finance commission performed its duties of investigation and recommendation of improvements so satisfactorily that the commission is retained and given similar powers of investigation and report, but no executive powers. This commission is appointed by the governor of the state and is simply an investigating committee of the stockholders of the corporation to keep them informed of the acts of their officers and employes. What will be the value of this commission in the daily life of the municipality remains to be seen. It is an official "Bureau of Municipal Research" such as have been doing good work in New York and Memphis and are engaged in similar work in other cities.

Civil service is provided for, also annual payments of installments of bonded indebtedness, a municipal newspaper, and many other details.

The latest experimental modifications of the Indianapolis charter embody the mistake of dependence on party organizations for nominations. The Boston experiment steers clear of this and embodies the best features of the commission and the centralized forms of municipal government, and its progress upon this, the most advanced course yet pursued by any city in the country, will be watched with interest.

## THE WATER SUPPLY OF THE PANAMA CANAL.

The problem connected with the construction and operation of the Panama canal are so numerous and so large that discussion of them will not cease until the canal is finished and its success is demonstrated either as planned or with such changes as future developments may demand.

One of the most recent commissions appointed to make a study of the canal and its problems is the special committee of the Chamber of Commerce of the state of New York, which is making a study of the adaptability of the plans for the canal to a constautly expanding commerce. The wording of the resolution appointing the committee seems to show a leaning toward a sea-level canal. This committee was appointed last March.

One of the members of the committee, Julio F. Sorzano, presented a paper to the American Society of Civil Engineers on November 17, in which he discusses the subject of the water supply for a lock canal. Because of its importance this subject has already had much attention, but has not been attacked from the outside very recently so that this discussion was about due.

Mr. Sorzano's conclusions are interesting. They may be briefly stated as follows:

There are twin three-flight locks at

Gatun with a total lift of 88 feet connecting the summit level, Gatun Lake, with the Atlantic, and a set of twin locks at Pedro Miguel with 32 feet lift and twin two-flight locks at Miraflores with 66 feet lift, and one and one-third miles of canal between the two lock locations, to connect the summit level with the Pacific level. The water supply for these locks is to be taken from Gatun Lake, which is expected to vary in depth from 47 to 40 feet according to the relation of draft of water by the locks to supply from rainfall, thus varying the total lift seven feet. The shallower depth is insufficient in fresh water for the largest steamers now in commission. Practical considerations require a net clearance of at least six feet in the lake and three feet in the canal, so that the total maximum depth in the lake is none too great for existing vessels, and any reduction below it cuts out the use of the canal by the larger vessels, down to about 33 feet salt water draft for the minimum depth of 40 feet.

The author then considers the water supply in rainy and dry seasons and some eleven classes of losses of water from the lake in detail, and gives for each an estimate of the reduction in level of the lake for each of the four months of the dry season, and of the increase in elevation due to the inflow for the same months.

Assuming 20 lockages each way per day up to the summit level and down to the other ocean, the author computes that, starting the dry season 2 feet above normal level, or at 47 feet depth, at the end of 30 days vessels drawing 41 feet cannot use the canal with safety; after 60 days the safe draft is less than 33 feet; after 90 days it is 28 feet; after 120 days 21 feet; and after 150 days, should the dry season happen to last so long, it reduces to 15 feet. If 30 lockages per day are assumed, the draft is less than 40 feet at the end of 30 days, 31 feet at 60 days, 24 feet at 90 days and 16 feet at 120 days. For the other 7 to 8 months of the year the water supply is ample for all purposes. Practically, therefore, the insufficiency of water either limits the lockages of vessels in the dry season to less than 20 per day or denies passage to the larger vessels during the dry season.

The discussion is put in simple and brief form and the replies of the defenders of the lock canal will be awaited with interest.

# THE QUESTION DEPARTMENT

**Pavements for Hot, Dry Climate.**

The city of Phoenix is considering the advisability of paving some of its business streets, and as I am a subscriber of your magazine I would like to have you recommend me to the proper persons with whom to correspond to obtain information as to what paving would be best adapted to a hot and dry climate such as we have here six months of the year. Any suggestions which you could furnish would be much appreciated.

T. J. P., Phoenix, Ariz.

Reference should be made to the "Business Directory," printed in each number of MUNICIPAL ENGINEERING, under the headings, "Civil Engineers," "Consulting Engineers," "Pavement Expert," particularly those making a specialty of pavements, for names of advisers on the subject. The contractors and the promoters and makers of various paving materials, whose names will be found in the same directory, can also give good advice, when due allowance is made for a natural prejudice in favor of their own material.

In general, it may be said that brick is a material which will stand any climate, and if the pavement is properly designed and laid to make allowance for the expansion, it should make a very satisfactory pavement for the conditions. If stone of proper quality is available, it will also be a durable material. Asphalt

has been used with success in California, in Utah and in Colorado, where the variations in temperature are, perhaps, as great as they are in Arizona, but temperatures are probably not as high. Consistency of the asphalt pavements can be varied to meet the requirements of temperature, and, therefore, an asphalt pavement can probably be designed which will give satisfaction. Bitulithic pavement has been used in the South, but perhaps not in as hot and dry a climate, but there seems to be no reason why that pavement, using asphalt, perhaps, instead of tar, should not meet the requirements. A wooden-block pavement would probably be satisfactory, except possibly during the infrequent rains, when the blocks would swell and then it might be necessary to relay considerable areas of the pavement. Probably this pavement would be too expensive, as the supply of wood would have to be carried for a considerable distance.

---

**Best Oil for Dust Laying and Road Preserving.**

Will you kindly give publicity in your "Question Department" as to the best oil or material for keeping down the dust, as well as preserving the wearing surface of the roads in a small New Jersey city, located on the coast, where the traffic from automobiles and other vehicles is quite heavy and the city is obliged to put forth its best efforts to keep its streets, which are its principal attraction, in first-class condition? Any suggestion which you or your readers can afford will be gratefully accepted. Respectfully,

MUNICIPAL SUBSCRIBER, ——, N. J.

The paper on page 381 of this number of MUNICIPAL ENGINEERING entitled "Three Years of Experience with Oiling Roads," tells what the difficulties in obtaining the proper oil are at the present time. The conclusion drawn from this experience corresponds with that already drawn by many other users of oil for treating roads. Only oils with an asphaltum base should be used. Oils with paraffine base are quite useless except in dry weather. This apparently means that oils from the States east of the Mississippi, with perhaps one or two exceptions, cannot be used, and that the asphaltic oils only of the western States, such as Kansas, Oklahoma, Texas and California, can be successfully used for road treatment.

Preparations of tar are also valuable.

A good description of the qualities needed in a bituminous binder for macadam roads will be found in the August number of MUNICIPAL ENGINEERING, vol. xxxvii, p. 109, and the cost of reconstructing a road with it is shown on page 143. Another full discussion of the difference between oils with paraffine and asphalt bases is given on page 236, the article also giving information about other processes of treating roads for the purpose of abating dust as well as for that of protecting them from the heavy wear of rapid automobile traffic.

Engineers have not yet devised a detailed specification for the necessary oils, and until that has been done the general specification above indicated must serve, with such additional requirements as to viscosity, adaptability to ranges of temperature, etc., as the various methods of construction devised may require.

The manufacturers of oils, tars and asphalts have done much experimenting, and can give much information, perhaps more than the engineers, except a few, mainly in official positions, who have been able to carry on extensive experiments.

---

**Oil Emulsions for Treating Roads.**

We are interested in soap which we understand is used for road emulsifier in connection with road oil. It is a subject we do not know much about, but if you have any special articles in your file with reference to the subject, or can gather any information, we will be pleased to hear from you.

H. J. M., Cleveland, O.

Judson's "Road Preservation and Dust Prevention" ($1.50) gives the best statement of the various experiments with oil emulsions in treating roads, and shows the composition, method of application and results from the use of several different processes, including the satisfactory tests in Boston and Chicago of such materials for reducing dust.

---

**Books on Railroad Construction.**

What books are printed on railroad construction that you would recommend? Please give the addresses of a few manufacturers of rails.

L. H. C., Bristol, R. I.

Camp's "Notes on Track" ($3) and Webb's "Railroad Construction" ($5) are two good books on the subject.

Prominent manufacturers and jobbers of rails in the East are: Bethlehem Steel Co., South Bethlehem, Pa.; Cambria Steel Co., Johnstown, Pa.; Lackawanna Steel Co., Buffalo, N. Y.; Carnegie Steel Co., Pittsburg, Pa.; Maryland Steel Co., Baltimore, Md.; Benjamin Watson, New York City; Ernest Wiener Co., New York City.

---

**Methods and Cost of Rail Welding.**

Kindly let me have a list of firms that handle electric welding of rails for street railway tracks. If you have any data on cost of such welding by any or all of the processes at present in use, or as to the results attained, I should be obliged for information concerning them.

A. B. R. C., City Engineer, ——, Ont.

The following firms contract for electric welding of rails for street railway tracks:

American Electric Welding Co., 40 W. 13th St., New York City.

Electric Welding Co., House Bldg., Pittsburg, Pa.

Lorain Steel Co., Johnstown, Pa.

Thompson Electric Welding Co., Lynn, Mass.

The Goldschmidt-Thermit Co., 43 Ex-

change Pl., New York City, have a process for welding of rails, which is not electric.

Apparently, electric welding is satisfactory in case there a thousand or more welds to make at one time; but otherwise it may be too expensive. This difficulty is not so great with the Goldschmidt-Thermit process.

The firms named will quote prices on a given number of welds, which will be much more satisfactory than estimates based on work in other towns, under quite different conditions.

**Water and Lighting Rates in Small Cities.**

We are very anxious to get some information regarding the rates charged for water and electricity (both commercial and street lighting) in cities having populations from 5,000 to 15,000. We want to make a comparison of the rates charged by municipal and privately-owned plants. We presume you have had articles in the columns of your magazine, from time to time, giving the data, and if you can give us the dates of these articles we will be glad to get them. We desire this information for a town where the question of a municipal plant will be decided in a very short time. F. S. C., St. Louis, Mo.

MUNICIPAL ENGINEERING has published a large number of articles on the subjects named. Following is a list of the articles, most of them in the Question Department, which have appeared since May, which either give information directly or refer to previous articles: "Articles on Municipal Ownership," Vol. xxxvii, p. 324; "Cost of Electric Current," in cities of 75,000 or more, p. 324; "Depreciation and Water Rates," giving reference to some previous articles on water rates, p. 183; "Cost of Street Lighting in Des Moines, Iowa," p. 189; "Information About Municipal Water Supply and Electric Light Plants," Vol. xxxvi, p. 315. The following article appeared in the January number: "Rates for Lighting and Contract Provisions" in towns of 1,000 to 3,000 population, Vol. xxxvi, p. 33. Comparison of the two articles giving rates for cities of 75,000 or more, and rates for towns of one to three thousand, shows that there are causes for variations in rates other than the size of the town.

**Concrete Water Tanks in Cold Climate.**

Have you any information on concrete water tanks? This city is contemplating constructing a 200,000-gallon tank. The weather here gets severely cold in the winter time, as low as 25 and 30 below zero. Do you believe that it would be practicable in this climate? Any information you can secure for me will be greatly appreciated.

W. E. ADAMS, Mayor, Deadwood, S. D.

Numerous standpipes and tanks have been built of concrete in recent years, in all parts of the country, and there seems to be no difficulty on account of cold winters. Methods of construction and examples of designs will be found in such books as Taylor and Thompson's "Concrete, Plain and Reinforced" ($5), Gillette and Hill's "Concrete Construction" ($5). Descriptions will also be found in MUNICIPAL ENGINEERING, vol. xxvi, pp. 43, 162, 428; vol. xxx, p. 257; vol. xxxi, p. 277; vol. xxxii, p. 87; vol. xxxiii, p. 183; vol. xxxiv, pp. 239, 307; vol. xxxiv, p. 5, describing a reinforced concrete standpipe at Attleborough, Mass., 118 feet high, which is probably subjected at times to very nearly as low temperatures as those named.

Perhaps some of our readers will report their experience with concrete tanks, and with concrete at low temperatures.

**Makers of Turbine Water Wheels.**

I desire catalogues and other matter relative to turbine water wheels, and wish you would kindly forward this inquiry to manufacturers of same. I want details of installation, cost, power developed, amount of water required, etc., and will appreciate it if you will place me in communication with at least one of the leading manufacturers at once. J. W. R., Granite, Okla.

Prominent makers and jobbers of such machinery in the west are James Leffel & Co., Springfield, O.; Allis-Chalmers Co., Milwaukee, Wis.; Barnard & Leas Co., Moline, Ill.; Davis Foundry and Machine Works, Rome, Ga.; Dayton Globe Iron Works, Dayton, O.; DeRoach Mill Mfg. Co., Bridgeport, Ala.; Mine and Smelter Co., Denver, Colo.; Trump Mfg. Co., Springfield, O. Other names can be found in Hendricks' Directory ($10).

**Information About Water Works.**

I am desirous of getting list of municipal and private water plants, with full description, size of plant, capital stock, bond issues, receipts, etc. Can you give me the information.

H. L. K., Mechanicsburg, Pa.

There is no recent publication giving the information desired for water plants in general. The "Manual of American Water Works," the last edition of which appeared in 1897, and the "Municipal Yearbook," issued in 1902, would together give most of the data desired, subject, of course, to changes since those dates. MUNICIPAL ENGINEERING publishes considerable information about water works from time to time. The latest compilation is running in current numbers, October, November and December, and gives data regarding many of the items named for cities of 25,000 to 50,000 population. The data regarding many cities are on file in this office, and are open for consultation.

A few of the items named are covered by the volumes of "Statistics of Cities," published by the U. S. Census Bureau, Department of Commerce and Labor, Washington, D. C.

**Rates for Electric Current.**

If you have any publication showing the cost, rate, etc., of the electrical plants of the United States, please send the same to us. J. H. S., Austin, Minn.

MUNICIPAL ENGINEERING for January,

1909, page 33, has an article on "Rates for Street Lighting," which will be of interest. This article gives much information about rates for private customers and for street lighting. There are a great many other articles on the subject in back numbers of the magazine. Particular reference may be made to an article in vol. xxxvi, page 315, entitled "Information about Municipal Water Supply and Electric Light Plants." This article gives references to the annual reports of the Massachusetts board of gas and electric light commissioners, the New York commission of gas and electricity and the Wisconsin state railroad commission, as well as to previous articles in MUNICIPAL ENGINEERING. Other articles in the same volume are "Municipal Street Lighting Plant," on page 373, and "Tungsten Lamps Compared with Arc Lamps," on page 216. In vol. xxxvii, page 175, is an article on "State Regulation of Electric Light Rates," and in the same volume, on page 189, there is an interesting article on "Cost of Street Lighting in Des Moines, Iowa."

---

**Sewer Plans and Prices.**

1. Where can I obtain man-hole and lamp-hole covers the most complete?
2. How would you suggest about the cover of a a lamp-hole? Should it come to the surface and be perforated, and would you suggest a stone about the top and a lid to rest on it, not on the tile?
3. Is there now, or has there been, a law lately to have sewers at any certain depth or sizes?
4. Could you refer me to prices for sewers complete, for man-holes, lamp-holes, Ys, Ts and fittings, per foot, rod or mile, depths averaging 7 to 8 feet, and sizes 8, 10 and 12 inches.
5. Is the law such that a borough can put in sewers without obtaining signatures from two-thirds the frontage, except a trunk sewer?
6. Would like a little advice as to the construction and operation of flush-tanks.
7. What firms repair surveying instruments, and where can I get good tapes?

M. J. D., Pa.

1. Local foundries are usually very ready to make man-hole covers and lamp-hole covers, according to specifications, unless the number of castings is very small. There are standard designs and weights which they can follow. The smaller towns must usually get such castings from a neighboring city. The Duplex Manufacturing and Foundry Co., New England Bldg., Cleveland, O., manufacture such castings, and will ship them anywhere.

2. The lamp-hole should come to the surface and the casting should be set on a brick, stone or concrete circular wall laid below the surface in such a way that neither the wall nor the lamp-hole cover will touch the pipe. The casting should never rest on the pipe, because the weight of casting or of traffic would be almost certain to break the pipe in the lamp-hole itself or the sewer-pipe on which it rests.

3. There is no law regulating sewer sizes and depths. The supervision of sewer plans in Pennsylvania is in the hands of the State Board of Health, and I presume that they have made some rulings and possibly published some regulations covering the sizes and depths of sewers. In general, no sewer should be less than 8 inches in diameter, unless it is very short and has very few connections. A sewer should, if possible, be laid deep enough to receive drainage from the cellars of the adjoining buildings and closets located in those cellars. In a residence district which is level it would be necessary to put the sewer 7 or 8 feet below the surface of the ground to do this, and this is probably the basis of any ruling which the State Board of Health may have made. There are exceptions, and the State Board of Health would be reasonable about these exceptions.

4. Back numbers of MUNICIPAL ENGINEERING have considerable information relative to the cost of sewers and their appurtenances. In the November number, vol. xxxvii, p. 326, will be found references to several such articles. Fair prices for sewers of the sizes mentioned would be, say, 75 cents for 8-inch, 95 cents for 10-inch and $1.10 for 12-inch. Man-holes with earth excavation cost from $30 to $40 each, lamp-holes $10 to $15. Of course there are many variations from these prices, on account of local conditions.

5. In many states the city government can cause the construction of sewers without waiting for petitions from the property owners. This is the best practice, and Pennsylvania should be able to follow it. Inquiry about this should be made of city officials or an attorney familiar with Pennsylvania improvement laws. Perhaps our readers can give some information on this point.

6. Flush tanks are quite desirable at the upper end of sewers which do not have very much sewage or water in them. The Pacific Flush Tank Co., 184 La Salle St., Chicago, or 43 Broadway, New York City, on request will send a catalogue of flush-tanks which will give full drawings and pictures, from which their constructions and action can be seen.

7. W. and L. E. Gurley, Troy, N. Y., repair instruments, and are reasonable in their charges. The Bausch-Lomb Co., of Rochester, N. Y., also make good instruments, and can do equally good repair work.

---

**Clay and Cement for Sewer Pipe Joints.**

Sewer men and plumbers here have had a habit for some years of using a blue clay mixed with cement to form a putty-like paste which they use for calking the joints of pipe sewers in wet trenches, claiming that the cement is not washed out when the clay is used, as it is apt to be with sand and cement mortar. Will you please say whether you have had other reports of clay being used for this purpose, and what you think of it. I have mixed small quantities of the clay with

cement and allowed it to set, both in air and in water, and find that where plenty of cement is used and considerable pains is taken to mix it thoroughly with the clay, it sets up hard.

E. R. W., Port Huron, Mich.

Can our readers give any information concerning this? Rosendale cement and raw pine tar have been used for making tight joints, and can be used in water. Sulphur and sand have also been used Small quantities of clay in sand tend to make the mortar more nearly impervious. Clay without cement has occasionally been used for jointing pipes. The mixture of cement with the clay would apparently be an improvement over the neat clay joint, and if the joints were not under water pressure or in contact with running water until the cement had set, the mortar would doubtless keep its place in the joint. The writer has had no experience with such a mixture, but would expect to find that a large proportion of cement would be necessary, and that the mixture must be very thorough. The difficulty of making a though mixture of putty-like clay and cement, and the increase in cost on account of increase in amount of cement, might easily balance the cost of keeping the water down in the trench until the cement in the joints has set.

MUNICIPAL ENGINEERING is desirous of having reports of experience in this line and will publish whatever is sent for that purpose.

---

**Cities Adopting the Commission Form of Government.**

Can you send us something about recent developments in municipal government by commission, after the Galveston, Des Moines, Boston or other plans? We would like to ascertain what cities have obtained or are seeking new charters of this sort, and some detail of the precise nature of the form of government sought.

THE REPUBLICAN, Springfield, Mass.

There are general laws giving cities the privilege of adopting the commission form of government in the States of Kansas, Colorado, California, Oregon, Washington, and restricting the application of the form to certain classes of cities or certain individual cities in Iowa and Texas. Atlanta, Ga., and Boston, Mass., have special charters, and so has Memphis, Tenn., which may be said to be the original city to be governed under a commission plan, having had some such method of city administration since it was made a taxing district after the yellow fever of the late '70's to get out from under its burden of debt.

Some discussion of the Boston plan, as compared with other commissions plans, and the Indianapolis plan will be found in the editorial department in this number of MUNICIPAL ENGINEERING.

The following articles in recent numbers of MUNICIPAL ENGINEERING will be of interest in this connection:

"Self-Government of Cities," vol. xxxvii, p. 103.

"Cedar Rapids Under the Commission Plan," vol. xxxvi, p. 17.

"A Municipal Business Manager in Staunton, Va.," vol. xxxvi, pp. 279, 309.

"Non-Partisan Municipal Elections," vol. xxxvi, p. 376.

"The Bureau of Municipal Research," vol. xxxvi, p. 375.

A list of prior articles on the subject will be found in vol. xxxvi, p. 37.

An article on the Memphis plan is in preparation for early publication in MUNICIPAL ENGINEERING.

---

**Construction and Operation of a Cement Plant.**

I have been asked to write to you for information in regard to making cement. I have plenty of good clay that will make cement, and I want to put up a cement plant. Can you give me some information on the subject?

W. I. S., Cœur d' Alene, Ida.

The financial end of a cement proposition is the most important end, since it must be properly carried or the project will not be developed, no matter what the value of the materials. This end is considered in a clear and careful, though brief, manner in Eckel's "Portland Cement Industry from a Financial Standpoint" ($2). Eckel also has a book on "Limes, Plasters and Cements" ($6), which goes somewhat into detail regarding the materials and manufacture of cement.

Much valuable information can be obtained from MUNICIPAL ENGINEERING, such articles as the following being particularly valuable:

"The Los Angeles Cement Plant," vol. xxxvi, p. 8.

"The Tonto Portland Cement Works at Roosevelt Dam, Ariz.," vol. xxxvi, p. 71.

"Profit in Portland Cement Manufacture," vol. xxxv, p. 166.

A list of earlier articles will be found in vol. xxxv, p. 99.

---

**Design of Cement Floor.**

I have begun the construction of a concrete house, and the same will have an 8-foot basement, first and second floors. Now, I want to concrete floors and walls in basement with Portland cement, and the first floor I want a layer of cement 5 or 6 inches in thickness, reinforced with fencing in bottom, as shown in sketch (not reproduced), to be laid on a wooden floor, same to be removed when cement dries. Now, how long should the false floor remain before removal, and do you think the reinforcement is strong enough to carry the weight when false floor is removed? If not, how about doubling the same by stretching 2 piles of fencing wire across, instead of one? You will confer a favor by replying in next issue of MUNICIPAL ENGINEERING

A. P. R., Lebanon, Ky.

The diagram shows two outside foundation walls, 12 inches thick, and an intermediate foundation wall, 8 inches thick; a floor 5 or 6 inches in thickness, reinforced with No. 12 wire, say 3 inches apart, and a No. 9 wire every 4 feet, the

ends attached to 1¼-inch water pipe laid along the outer foundation walls near the upper surface of the floor; the wires dropping to the bottom of the floor for the middle third of each span, where two 1-inch longitudinal wires show in cross-section; and rising near the surface of the floor over the intermediate support, thus making a continuous slab reinforcement over the two spans of the floor.

The weight the floor is to carry and the spans are not given, so that a definite answer as to the sufficiency of the design cannot be given. The principle of the design is one of common application, and for a dwelling house of ordinary dimensions the reinforcement may be sufficient, unless the spans are too great. It may be possible to decrease the thickness of the floor for such a case.

In warm weather the forms should be left in for three weeks, and in cold weather for four weeks or even more, as the settling of cement is greatly retarded by cold, and may be stopped entirely during a period of freezing weather. These periods are perfectly safe under all but the most extraordinary conditions, and are frequently reduced to one and two weeks, under specially favorable circumstances, on rather unimportant work. The reinforcement may be doubled as suggested if a single layer of the wires is insufficient, although increasing the size of the wires or putting them closer together, would be somewhat more satisfactory, at least theoretically.

Taylor and Thompson's "Concrete, Plain and Reinforced" ($5) gives formulas and tables for determining proper sizes of reinforcement and thickness of floors for various weights and spans. So does Mensch's "Reinforced Concrete Pocket Book" ($10).

# FROM WORKERS IN THE FIELD

**Practical Points from Practical People.**

**Contributions to this Department are invited. Give from your experience for the benefit of others. No matter about the style of the composition, the fact is what is wanted. Use the Question Department for what you want to know; use this Department for what you can tell others.**

### Merchants' Association Review.

To the Editor of MUNICIPAL ENGINEERING:

Sir: On page 320 of your November issue the statement is made that the publication of the Merchants' Association Review was stopped by the 1906 fire. The paper missed very few numbers, and I get my copy regularly each month.

ERNEST MCCULLOUGH, Chicago, Ill.

### Relative Proportions of Sizes of Pipes in Water Supply Systems.

A very important matter in the design of a waterworks system intended to supply fire protection is the size of the distribution mains. A comparison of the distribution systems of existing waterworks, especially the older plants, is not a proper method of determining the sizes of pipes for another system, for several seasons: Thus the earlier systems were not designed with proper provision for fire service, and they contain too large a proportion of small pipes. Some cities cover much larger areas than others of the same population, and should require larger proportions of the larger mains. Some cities are able to distribute water from a center in small districts and thus keep down the proportion of the larger pipes. These and other important reasons make it necessary to design each pipe system to suit its own conditions. With these warnings, some information on this question can be gathered from the following table, which gives in the last column the total mileage of water distribution mains within the city limits, not including supply mains from sources of supply at a distance, nor distribution to other corporations than the city named. The other columns give the percentage of this total mileage which each size of pipe bears. This makes the figures for each size of pipe fairly well comparable, some attention having been given to the relative total lengths.

It will be noted that few cities have pipes less than 4 inches in diameter. They are valuable only for domestic supply to very small districts. The percentage of 4-inch pipe is very large in a few cities. Fire service requires larger sizes, even when steam fire engines are used, and the cities having large propor-

tions of 4-inch pipe doubtless have inefficient service at large fires. Even 6-inch pipe is not of the highest efficiency for districts liable to have large fires, for the number of efficient fire streams from a 6-inch system is limited. The cities having large proportions of 6-inch pipe either have inefficient fire service or they have very small, congested districts requiring the larger sizes.

Manufacturing and business cities with concentration of buildings require at least 8-inch pipe for efficient fire service, and those cities in the table having large proportions of 8-inch pipe are rather noted for their efficient fire service. The city of Indianapolis is scarcely comparable with the others in the table, on account of its larger size, and it is included only by request.

SIZE OF DISTRIBUTION MAINS IN WATER WORKS SYSTEMS, CITIES OF 25,000 TO 50,000 POPULATION.

Percentage Length of Each Size of Total Mileage of Distribution of Mains.
(Supply mains outside city limits not included.)

| City. | Less than 4 in. | 4 in. | 5 in. | 6 in. | 7 in. | 8 in. | 10 in. | 12 in. | 14 in. | 15 in. | 16 in. | 18 in. | 20 in. | 24 in. | 27 in. | 30 in. | 36 in. | Total Length Dist. Mains. Miles. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Birmingham, Ala. | ... | 7.84 | ... | 39.75 | ... | 30.74 | 3.24 | 7.44 | ... | ... | 5.86 | 0.04 | 0.21 | 2.88 | ... | ... | ... | 127.18 |
| Jacksonville, Fla. | ... | 4.1 | ... | 69.6 | ... | 8.7 | 8.0 | 2.6 | 1.0 | ... | 3.2 | ... | 2.8 | ... | ... | ... | ... | 24.38 |
| Pensacola, Fla. | ... | 4.8 | ... | 89.1 | ... | ... | ... | 5.0 | 1.1 | ... | ... | ... | ... | ... | ... | ... | ... | 19.28 |
| Tampa, Fla. | 2.8 | 7.5 | ... | 61.4 | ... | 14.8 | 9.4 | 4.1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 30.15 |
| Macon, Ga. | ... | 23.3 | ... | 47.5 | ... | 4.7 | 7.7 | 7.6 | 1.6 | ... | ... | ... | 7.6 | ... | ... | ... | ... | 34.26 |
| Peoria, Ill. | ... | 26.1 | ... | 50.9 | ... | 16.9 | 3.4 | 1.3 | ... | 0.1 | ... | ... | 2.4 | ... | ... | 3.1 | ... | 99.16 |
| Rockford, Ill. | 0.7 | 27.2 | ... | 31.3 | ... | 13.9 | 11.6 | 6.0 | ... | 5.6 | ... | ... | 0.4 | ... | ... | ... | ... | 77.48 |
| Springfield, Ill. | 0.5 | 17.1 | ... | 58.9 | ... | 0.3 | 17.1 | ... | 3.0 | ... | 2.9 | ... | 1.7 | 1.4 | ... | ... | ... | 78.40 |
| Ft. Wayne, Ind. | 0.5 | 6.5 | 0.1 | 62.0 | ... | 12.7 | 1.8 | 9.5 | ... | ... | 4.2 | ... | 0.6 | 1.4 | ... | .02 | 0.7 | 94.5 |
| Indianapolis, Ind. | ... | 6.3 | ... | 49.6 | ... | 20.3 | 5.3 | 9.6 | ... | ... | 4.2 | ... | 2.3 | 1.3 | ... | 0.5 | ... | 273.14 |
| South Bend, Ind. | 0.4 | 4.6 | ... | 65.5 | ... | 4.1 | 9.3 | 11.2 | 0.1 | ... | 1.5 | ... | 2.3 | 1.1 | ... | ... | ... | 72.7 |
| Bangor, Me. | ... | 24.5 | ... | 50.8 | ... | 12.0 | ... | 4.0 | ... | ... | 2.7 | ... | 6.0 | ... | ... | ... | ... | 40.0 |
| Lewiston, Me. | ... | 10.3 | ... | 44.7 | ... | 17.0 | 4.1 | 11.3 | 1.6 | ... | 2.2 | 1.9 | 2.4 | 4.5 | ... | ... | ... | 32.49 |
| Chelsea, Mass. | ... | 4.3 | ... | 62.6 | ... | 12.7 | 19.2 | ... | ... | ... | 1.2 | ... | ... | ... | ... | ... | ... | 39.07 |
| Everett, Mass. | ... | 13.7 | ... | 56.0 | ... | 18.1 | 5.6 | 3.0 | 0.7 | ... | 0.9 | ... | 1.3 | 1.1 | ... | ... | ... | 43.51 |
| Fitchburg, Mass. | ... | 28.4 | ... | 42.6 | ... | 11.1 | 5.6 | 3.0 | 2.6 | ... | 8.6 | 1.0 | 1.0 | ... | ... | ... | ... | 63.10 |
| Gloucester, Mass. | ... | 5.2 | ... | 50.0 | ... | 13.7 | 12.2 | 14.0 | ... | ... | 0.3 | 1.0 | 1.6 | ... | ... | ... | ... | 34.98 |
| Haverhill, Mass. | ... | 33.4 | ... | 34.9 | ... | 13.1 | 4.8 | 8.7 | 2.1 | ... | 3.5 | ... | ... | ... | ... | ... | ... | 50.65 |
| Malden, Mass. | ... | 14.6 | ... | 46.0 | ... | 16.4 | 5.8 | 15.1 | 1.8 | ... | 0.6 | ... | ... | 16.5 | ... | ... | ... | 82.66 |
| North Adams, Mass. | 1.0 | 38.2 | ... | 23.9 | ... | 6.7 | 7.9 | 3.4 | 1.8 | ... | 4.76 | ... | 0.55 | ... | ... | ... | ... | 42.75 |
| Quincy, Mass. | 19.93 | 0.2 | 44.83 | 0.2 | 18.1 | 6.6 | 4.83 | ... | ... | ... | ... | ... | 5 | ... | ... | ... | ... | 92.42 |
| Salem, Mass. | ... | 23 | ... | 44 | ... | 14 | 8 | ... | ... | ... | 7.5 | ... | 1.4 | ... | ... | ... | ... | 55 |
| Taunton, Mass. | ... | 13.6 | ... | 53.3 | ... | 15.7 | 0.1 | 8.4 | 0.9 | ... | 0.7 | ... | 2.2 | 1.1 | ... | ... | ... | 58.4 |
| Waltham, Mass. | 4.0 | 25.2 | ... | 36.9 | ... | 18.4 | 6.4 | 6.5 | ... | ... | 4.8 | ... | ... | ... | ... | ... | ... | 53.8 |
| Battle Creek, Mich. | ... | 6 | ... | 54.2 | ... | 29 | 0.5 | 5.5 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 47.2 |
| Lincoln, Neb. | ... | 21.4 | ... | 63.1 | ... | 4.6 | 4.0 | 5.3 | ... | ... | 0.6 | ... | 1.0 | 0.5 | ... | ... | ... | 62.6 |
| South Omaha, Neb. | ... | 3.0 | ... | 22.7 | ... | 48.4 | 6.7 | 4.3 | 2.2 | ... | 6.2 | 0.3 | ... | ... | ... | 5.7 | ... | 37.0 |
| Atlantic City, N. J. | ... | 26.3 | 0.4 | 32.0 | ... | 16.7 | 2.8 | 16.0 | 0.2 | ... | 1.6 | 0.2 | 7.6 | ... | ... | 6.2 | ... | 82.35 |
| Auburn, N. Y. | ... | 10 | ... | 64 | ... | 8 | 2 | 15 | ... | ... | ... | 1 | ... | 10 | ... | ... | ... | 64.6 |
| Binghamton, N. Y. | ... | 13 | ... | 50 | ... | 12 | 14 | ... | ... | ... | 1 | ... | ... | ... | ... | ... | ... | 36.1 |
| Newburgh, N. Y. | ... | 34 | ... | 39 | ... | 6 | ... | 14 | ... | ... | ... | ... | ... | 6 | ... | ... | ... | 40.2 |
| Charlotte, N. C. | ... | 27.3 | ... | 55.5 | ... | 2.6 | 1.2 | 5.6 | ... | ... | 2.9 | ... | ... | 4.9 | 1 | ... | ... | 19.27 |
| Wilmington, N. C. | ... | 20 | ... | 48 | ... | 15 | 2 | 15 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 15.14 |
| McKeesport, Pa. | 3.9 | 41.9 | ... | 36.0 | ... | 11.2 | 1.7 | 3.2 | ... | ... | 1.9 | ... | 0.2 | ... | ... | ... | ... | 29.32 |
| Columbia, S. C. | 4.4 | 0.8 | ... | 53.3 | ... | 7.5 | 4.9 | 20.3 | ... | ... | 0.6 | 0.8 | 3.8 | 3.6 | ... | ... | ... | 31.47 |
| Petersburg, Va. | ... | 22 | ... | 51 | ... | 10 | 5 | 8 | ... | ... | 5 | ... | ... | ... | ... | ... | ... | 26.35 |
| Roanoke, Va. | 0.9 | 37.5 | ... | 38.8 | ... | 6.9 | 6.5 | 4.7 | 0.4 | ... | 4.3 | ... | ... | ... | ... | ... | ... | 45.91 |
| Wheeling, W. Va. | 0.9 | 41.6 | ... | 23.8 | ... | 8.4 | 2.9 | 5.3 | 2.9 | ... | 3.4 | 0.3 | 8.3 | 2.2 | ... | ... | ... | 49.07 |
| Superior, Wis. | ... | 4.0 | ... | 53.4 | ... | 12.9 | 3.5 | 22.1 | 0.4 | ... | 3.7 | ... | ... | ... | ... | ... | ... | 47.85 |

**The Water Supply of McKeesport, Pa.**

To the Editor of MUNICIPAL ENGINEERING:

Sir: I have read with interest your data upon water supplies, from time to time. In reading over your account of the McKeesport (Pa.) system, in your November number, I find that your information is a little out of date.

Until within a year and a half, McKeesport was supplied with water partly from wells and partly from the Youghiogheny river. Since October, 1908, the entire supply has been taken from the Youghiogheny river, and not only filtered but softened as well. Our experience with the softening plant at McKeesport indicates that, with a water of this character, the softening process renders the water fit for all purposes without subsequent filtration.

Before the installation of the treatment plant, the average daily consumption for half the year was about 8,000,000 gallons. This was due to waste through leaky fixtures and pipes, the free sulphuric acid in the water destroying house plumbing within a month, at certain periods of the year. The average water consumption during the last year has closely approximated 4,000,000 gallons per day, with a maximum consumption very little in excess of this.

The McKeesport plant has only three pumps, serving distribution mains with a nominal capacity of approximately 11,000,000 gallons, but all of these pumps are antiquated, and it is doubtful whether more than 8,500,000 can be supplied by them. The city of McKeesport will be obliged within a comparatively short time to replace the existing pumps with modern machinery. The city has two low-lift steam turbine centrifugal pumps of 7,500,000 gallons' capacity each, for raising the water to the treatment plant.

ALEXANDER POTTER, C. E.,
New York City.

---

**Pavement Guarantees.**

A letter to the editor of the *Wichita Eagle*, which appeared November 14, gives an excellent argument for expert advice and supervision of pavement construction, and is applicable quite as well to other materials as to asphalt. The article referred to in the letter is one on "Asphalt Pavement Thickness and Guaranty Period," by J. W. Howard, which appeared in the November number of MUNICIPAL ENGINEERING, vol. xxxvii, p. 333. The letter is as follows:

I notice in your editorial comment in your issue of November 10th of the refusal of the asphalt companies to give a ten-year guarantee, the statement: "It is assumed that the paving they put down is not good and will not last ten years, or they would not object to the ten-year maintenance clause." And you recommend as a solution, "Pave with brick."

Permit me to ask, Why not put the same test to brick pavement and require them to give a ten-year guaranty and retain 10 per cent. of their contract price for 10 years, the same as is required of the asphalt companies, and not let the brick contractor off with a shorter term of guaranty than is required of other pavements. Is there anything about the condition of brick pavement laid four or five years ago on William street, for instance, to indicate that the city should not have the same measure of protection on brick pavement as on other pavements, and might not more rigid specifications and more rigid inspection yield better results through better construction at less cost than through what the writer believes to be the delusion of guaranties.

Surely the brick which have been laid in neighboring and other cities throughout the country for ten years are not, as a rule, in such condition as to warrant such a distinction and class legislation.

While on the subject of guaranty, it is well known that the surety companies have all refused to issue bonds for any form of pavement for any contract for more than five years. May not the 10 per cent. cash retained for ten years be merely a "sop," which at the end of the guaranty period will merely leave the city with a worn-out pavement and 10 per cent. of its cost (which is entirely inadequate to put the pavement in repair) on its hands?

May not the 10 per cent. retained merely be added to what would otherwise be the contract price and account for the higher price, if such exists, which you say is being charged in Wichita in excess of other cities?

May not Wichita be "hiding its head in the sand" under the 10-year-guaranty proposition, and getting nothing but a poorly-laid pavement, after all?

May not an article published in the November (1909) number of the MUNICIPAL ENGINEERING, be correct in the opinion it gives from leading engineers throughout the country, that the 1½-inch asphalt wearing surface specified at Wichita is too light to be durable?

May not the bad condition of First street asphalt pavement, to which you refer, be caused by poor and flimsy construction.

May it not be better to specify a standard wearing surface of 2 inches for asphalt pavement, invariably recommended by the engineers quoted in the MUNICIPAL ENGINEERING article referred to, and a little less guaranty be more to the interest of the city, and give us a better and more lasting pavemnt?

Might not some of the money now paid to the surety companies and held from the contractors, which, of course, add to their bids, be better expended in better construction and more thorough and scientific inspection of the laying of the asphalt wearing surface, and the balance left in the taxpayers' pockets?

In conclusion, might it not be to the interest of the taxpayers, in view of the large amount of pavement under construc-

tion and contemplated, to employ one of the several high-class firms of expert pavement engineers, who have devoted their lives to this branch of engineering, to advise with the city engineer and commissioners not only on the matter of providing specifications, which, economy and durability considered, will get the most economical results for all classes of pavement, but also to get the benefit of the scientific inspection and testing bureau of such experts while the work is under construction.

If we were to build a bridge, a septic tank or dam or water filtration plant, costing far less than pavements are costing the city of Wichita, we would employ the best specialists in those lines, which the profession can offer, as consulting engineers to advise with the city engineer, and other officials, in the making of plans and specifications and construction of the work. Why not follow the same business methods in pavement construction?

I submit that it is not fair to any city engineer to place upon him the responsibility of making plans and specifications in constructing pavement and carrying out the technical details of such construction, without giving him the benefit in a consulting capacity, of the best engineering advice procurable.

In short; may it not be better to spend more money for integrity and inspection of construction and less for guaranties?

Would it not be well, and to the best interest of the taxpayers, to defer the awarding of any more contracts and the acceptance of any more petitions for any kind of pavement, until the specifications have been gone over thoroughly and revised after consultation with such experts?

In the writer's judgment, the hundreds of thousands of dollars being expended, and the few hundred dollars such consultation would cost, warrant the employment of two such firms of experts to come to Wichita to go over the specifications jointly with the officials. The work would doubtless be completed within a month, and the actual time, doubtless, would not exceed a week, while no pavements can be laid on contracts not yet let, for at least five months. Let us go at this matter on business principles, without prejudice.

---

**Amiesite.**

To the Editor of MUNICIPAL ENGINEERING:

Sir: Referring to your inquiry, "What Is Amesite?" on page 256 of your issue for October, 1909, I note that the true name is "Amiesite," and designates a bituminous concrete mixture, which New Jersey authorities have tested for several years successfully, in making bituminous macadam pavements. The name Amiesite is derived from the name of the inventor, Joseph Hay Amies, to whom letters patent of the United States (No. 929,813) were granted August 3, 1909, broadly covering the process of making the mixture and building a road with it.

Amiesite, in a cold state, and before it is rolled, is so friable that it may be shoveled or otherwise manipulated as readily as ordinary uncoated mineral aggregates, but when rolled in a cold state compacts to a finished surface which is instantly ready for traffic. The peculiar characteristics of Amiesite result from the saponification of certain elements in the asphaltic, bituminous or resinous substance of the binder by the use of an alkali, preferably calcium oxid or calcium hydrate. The use of such a binder not only saves the entire cost of heating materials at the roadside, but produces a superior pavement.

ARTHUR E. PAIGE, Philadelphia, Pa.

# MUNICIPAL MATTERS IN COURT

## Decisions of the Higher Courts—Meters Enjoined—Not a Boulevard—Gravel Road Law Invalid.

**Decisions of the Higher Courts of Interest to Municipalities.**

PREPARED BY JOSEPH W. KENNEY, ATTORNEY-AT-LAW, INDIANAPOLIS, IND.

Constitutional Limit of Taxation.—The constitutional limit of taxation does not embrace special assessments for municipal improvements. — Judgment (Cir. App.), 115, S. W., 126, reversed; City of Austin v. Nalle (Tex.), 120 S. W., 996.

Opening of Alley—Assessment for Benefits.—Under St. Louis City Charter, Art. 6, Sec. 5 (Ann. St., 1906, p. 4850), providing that in the opening of an alley the benefits shall be paid by the owners of

property in the block abutting on the proposed alley, where an alley was opened in continuation of an older alley which extended part way through the block, all of the owners of property abutting on the completed alley were liable to assessments for benefits.—City of St. Louis v. Calhoun (Mo.), 120 S. W. 1152.

Defect in Estimate for Improvement—Property Owners' Liability.—A city charter provided that preliminary to the making of any street improvement the council should estimate the cost, that a copy of the resolution should be published, that a time should be fixed for protests, that in case of protests by a certain proportion of owners, no improvement should be made unless a certain number of members of the council should vote for it, that the expenses should become a lien, and that in an action to enforce the lien a recovery should be permitted to the extent of the proper proportion of the value of the work or material which would be chargeable on such lot or land, notwithstanding any informalities, irregularities or defects in any of the proceedings. Ballinger's Ann. Codes & St., Sec. 943. *Held*, that the fact that the contract for an improvement called for twice the amount of the estimate was no bar to a foreclosure of the lien, as the property owners, if misled by the estimate, might be entitled to have their assessments reduced "to the extent of the proper proportion of the value of the work," and the failure to make an accurate estimate was a mere defect in the proceedings, and not such a fraud on the property owners as to invalidate the proceedings, though it might, perhaps, entitle them to a reduction of the assessment.—City of Chehalis v. Cory (Wash.), 102 P. 102.

Damage to Property Due to Defective Paving of Alley—Liability of City.—A city is liable for damage to property due to the negligent manner in which an alley was filled and repaved, though it employed an independent contractor to do the work, where it retained control thereof.—Thillman v. City of Baltimore (Md.), 73 A. 722.

City's Duty to Keep Streets in Safe Condition—No Evasion of Liability.—A city may not relieve itself of its duty to the public to keep its streets in a reasonably safe condition for public travel by placing an independent contractor in charge of the streets, nor may the contractor evade a like duty through an assignment of his contract.—Seattle Lighting Co. v. Hawley (Wash.), 103 P. 6.

City Can Not Acquire Right by Prescription to Discharge Sewage into Stream.—Under Rev. Codes, sec. 1566, authorizing the State Board of Health to prohibit the discharge of sewage into a stream if it is detrimental to public health, a city may not acquire by prescription the right to discharge sewage into a stream, since a city is but a governmental agency of the State, which could not acquire prescriptive rights against the State, and since the right of the Board of Health to prohibit such discharge was a public right for protection of health, against which there could be no prescription, and since, further, such right to prohibit the pollution of a stream is within the police power, which the State can not waive.—Miles City v. Board of Health of State of Montana, 102 P. 696.

Legislative Authority Not Necessary for Erection of Municipal Buildings.—Though legislative authority is desirable, it is not absolutely necessary to enable municipal authorities in cities of the size of Raleigh, N. C., to contract debts for the erection of a municipal building, since such a building is a recognized necessity, as much as a court house is to a county.—Hightower v. City of Raleigh (N. C.), 65 S. E. 279.

Act of Council Refunding Money Forfeited upon Contract Invalid.—Under Sumpter City charter (Sp. Laws 1901, p. 95), providing that demands which the council shall pay shall be for corporate purposes, and none other, the council has no power to order the payment to a contractor of money forfeited to the city because of the contractor's failure to perform his contract; the claim for repayment not being for a corporate purpose.—Naylor v. McCulloch (Ore.), 103 P. 68.

Constitution Prohibiting Municipal Pecuniary Aid to Private Corporations—Construction.—Under Const., art. 1, sections 19, 20, as amended in 1875, providing that no donation shall be made by the State or any municipality to a corporation, etc., the legislature may not authorize municipal aid to private corporations, whether such aid is a direct pecuniary aid or by means of a release from a pecuniary burden.—Jersey City v. North Jersey St. Ry. Co. (N. J. Sup.), 73 A. 609.

Council Can Not Make Unreasonable Reduction in Salary of Public Officer.—A city council empowered, in the exercise of its discretion, to fix the salary of the city auditor at a sum not exceeding $1,500 per year, having reduced it from $1,500 to $300 in a manifest attempt to abolish the office, which it could not do, or to remove the officer, which it could not do in the absence of cause, will be ordered to restore it to not less than $900; the evidence showing that to be the lowest reasonable salary for the office, and any amount above that being a matter of discretion.—State ex rel. Thurmond v. City of Shreveport (La.), 50 So. 3.

Act Authorizing Construction of Water Works and Lighting Plants—Construction as to Private Use.—General Municipal Incorporation Act (Gen. Laws 1906, p. 898), empowering cities of the sixth class to acquire, construct and maintain water works and works for light for the inhabitants thereof, authorizes a city of the sixth class to construct and maintain a plant to supply its inhabitants with water for their private use, as well as for public purposes. Such act also authorizes a city of the sixth class to construct and maintain a plant to supply its inhabitants with light for their private use as well as for public

purposes.—Cary v. Blodgett (Cal.), 102 P. 668.

Right of Property Owner to Be Informed of Public Improvement.—It is the right of a land owner specially affected by a public improvement to be informed by notice of the time and place appointed for the meeting of the council to consider their proposed action.—Groel v. City of Newark (N. J.), 73 A. 522.

Forfeiture of Contractor Not Affected by Subsequent Action of Council.—Where after plaintiff had been declared the lowest bidder for paving work and his bid accepted by the city, he refused to enter into a contract, and a deposit required and made by him was declared forfeited, the rights of the parties were thereby fixed, and were not affected by the subsequent action of the city council in declaring another the lowest bidder and accepting his bid.—Decree (C. C. 1908), 159 F. 221, affirmed.—Turner v. City of Fremont (U. S. C. C. A. Neb.), 170 F. 259.

Contract—Proposal to Use Certain Brand of Brick Does Not Modify Specifications.—Where the specifications upon which paving bids were based provided that the city engineer might make certain tests of the brick to be used at any time during the progress of the work, and that if they did not stand the tests they should be rejected, and also required bidders to deposit samples of the brick on which their bids were based, such samples to be labeled, showing the commercial name of the brick, a statement in plaintiff's bid that he proposed to use "Capital" brick as per sample submitted did not work a modification of his proposal to do the work according to the plans and specifications, so as to make the quality of his samples determine the quality of the brick to be used, and to do away with the provisions requiring them to answer the specified tests. —Idem.

Contractor Abandoning Work After Breach of Contract by City—Liquidated Damages.—Where a contractor for city sewers abandons the work after the city had breached the contract by refusing to make payments, and thereafter the city notified the contractor to quit the work, the contractor was not liable for the liquidated damages stipulated for in the contract for delay in completion.—Shea v. Sewerage and Water Board of New Orleans (La.), 50 So. 166.

Contractor Must Pay Cost of All Work Rendered Necessary in Construction.—A contractor for a city sewer must pay the cost of work rendered necessary in doing the work, such as the draining of a street necessary by reason of a pond in existence when the letting of the contract was advertised and the expense of removing and repairing overhead wires.—Idem.

Sewer Contractor May Recover for Extra Work.—A sewer contractor may recover for extra work rendered necessary for the construction without showing that the extra work was ordered in writing as provided by the contract.—Idem.

Contractor, Prevented by City from Using Labor-saving Appliance, May Recover.—Where a sewer contractor, who had devised a successful appliance for the removal of surplus cement by drawing the appliance through the sewer pipe as construction proceeded, was prevented by the city from using the appliance, the contractor could recover the difference between the cost of cleaning the sewers with and without the appliance.—Idem.

Completion of Contract Work by City—Contractor Entitled to Balance Left.—Where a city forbade the contractor for the construction of sewers to go on with the work, and completed the work at the expense of the contractor under the contract providing that any balance left after completing the work must be paid to the contractor, the latter could sue for the balance without showing that he had completed the work to the satisfaction of the engineer, though the contract provided that no payment should be made until the work was completed to the satisfaction of the engineer.—Idem.

Effect of Failure to Publish Ordinance. —Where publication of ordinances and by-laws is prescribed by the city charter, a failure to publish will generally invalidate them.—City of Barre v. Perry & Scribner (Vt.), 73 A. 574.

Force of City Ordinance.—A valid city ordinance has the force of a legislative act upon those upon whom it operates.—Cleveland, C., C. & St. L. Ry. Co. v. Powers (Ind.), 88 N. E. 1073.

Mandamus to Compel Removal of Obstructions from Street.—In 1899 the park commissioners of Buffalo obstructed streets crossing a parkway. Persons interested made efforts to remove the obstructions without success, and in 1908 one of them obtained an alternative writ of mandamus requiring the commissioners to remove the obstructions. Held, that the right to the writ was not barred by laches. —In re Smith (N. Y.), 118 N. Y. S. 95.

Rails of Street Railroads Should Be Flush with Surface of Ground.—The rails of all street railroads ought to be flush with the surface of the ground.—Pascagoula St. Ry. and Power Co. v. Brondum (Miss.), 50 So. 97.

Incorporation of Telephone Company Gives No Right to Use of Streets.—Greater New York Charter (Laws 1901, p. 36, c. 466), sec. 71, provides that the city's rights in its streets are inalienable. Section 72 provides that every grant of or relating to a franchise of any character to a person or corporation must, unless otherwise provided in the act, be by ordinance. Section 73 provides that after the approval of the act no franchise or right to use the streets, etc., shall be granted by the board of aldermen for more than twenty-five years. Held, that the incorporation by the State after the act went into effect of a telephone company to con-

struct or otherwise obtain, own and operate lines of electric telegraph and telephone did not give it the right to operate in the streets of New York City in the absence of a grant from the city by ordinance.—In re New York Independent Telephone Co., 118 N. Y. S. 290.

**Installation of Water Meters Enjoined in Peoria.**

A temporary injunction restraining the city of Peoria, Ill., from enforcing the ordinance recently passed providing for the installation of meters by the people, was granted by Judge Humphrey, of the United States court, recently. The injunction was granted on the petition of the Peoria Water Works Company, and was prompted by the council refusing to pay a bill of $13,000 for hydrant rentals. The bill was held up to force the company to lay additional mains.

**Capitol Avenue Indianapolis Not a Boulevard.**

According to a decision handed down by Judge Charles Remster, of the circuit court, Capitol avenue, in Indianapolis, Ind., is not a boulevard. Judge Remster holds that up to 1909 the city council had no power to transfer any street to the park board for boulevard purposes, and the park board had no power to accept such street. The ordinance making Capitol avenue a boulevard, from Indiana avenue to the Fall creek bridge, was passed in 1906, and became effective January 1, 1907. The park board took possession of the street, and, after improving the street surface, established boulevard rules and police supervision, much to the dissatisfaction of the property owners and people who desired to use the street for heavy traffic. The county council also refused to build a new bridge at Capitol avenue across Fall creek because farm wagons would not be permitted to drive on the avenue. An effort will probably be made now by the city council to enact another ordinance making Capitol avenue a boulevard and transferring it to the park board, in accordance with the law of 1909, which gives the council that power.

The decision was rendered in the case of an applicant for a license to sell liquor at the northwest corner of Indiana avenue and North street. The county commissioners denied the application on the ground that the proposed saloon would be within 500 feet of Capitol avenue, a boulevard. Judge Remster granted the license on the ground that it is not a boulevard. After reviewing the park laws and ordinances, Judge Remster announced the following conclusions:

In 1906, when the ordinance of relinquishment was passed by the common council, the common council could not thereby divest itself of the control of Capitol avenue, as it was without power to do so, the law having vested such control in the common council, and the law had not empowered it to divest itself thereof.

When the act of 1909 was passed the legal control of Capitol avenue was vested in the common council by law, and has never since been divested. The ordinance of relinquishment passed in 1906 being a nullity, could not serve to relinquish such vested power at any time.

The board of park commissioners being in possession of Capitol avenue when the act of 1909 took effect does not give such board the acquisition of the then legal vested control in the common council.

It has been suggested that the act of 1909 legalized the acts of the board of park commissioners. This is true, but it does not purport to legalize the act or the non-action of the common council. It can not legalize an act the common council did not do. It had not relinquished its then vested control over Capitol avenue, and there was nothing to legalize. It might be suggested that the legalizing act does not pretend to legalize anything but acts of the park board by it performed.

It has been suggested that regardless of how the board got possession, if in possession when the acts of 1909 took effect, and such acts gave such board the right to procure such street, then when in possession under a law of a street proper to be acquired by such act, their possession would make a legal acquisition. The same might be said if the board would now take possession of Washington street, as to all persons affected thereby in one or six months or one year from now. As heretofore seen, the law does not work ipso facto.

The legislature did not divest the common council of control of any street, nor did it vest the control of any street in the park board. It simply provided and authorized the park board to become vested with control and the common council to divest itself of control.

**An Indiana Gravel Road Law Invalid, but Bonds Issued Under It Are Valid.**

The Indiana supreme court has rendered a decision in the gravel road case which proves a great surprise to the improvement promoters and bondholders. The court holds that, while the law is destroyed, all bonds are valid. It says that a part of the law is invalid because it only authorizes gravel roads to be constructed by taxation on "a petition signed by fifty or more freeholders and voters of any township, which includes any incorporated city or town having a population of less than thirty thousand inhabitants." This provision is held to make the law a local and special act. The decision continues:

These requirements of the law manifestly exclude, first, every township which does not have an incorporated town or city with a population of fewer than thirty thousand; second, every and all townships which have no incorporated town or city whatever.

Certainly such a classification is not a natural and reasonable one. It can not be said to inhere in the subject-matter of laying out, establishing and improving public highways.

We conclude, and so hold, that section 63 of the act in question (section 7712, Burns, 1908) is unconstitutional and therefore void. Excepting section 81, it may be said that all of the sections of the act which appear and follow under the caption "Gravel Roads by Taxation," from section 62 to 82 (sections 7711-7733, Burns, 1908), inclusive, depend upon said section 63, and are so mutually connected and associated therewith that each and all must go down together.

Under the law bonds have been issued and sold amounting probably to $10,000,000 or $15,000,000. The court did not pass on the validity of these bonds, and, in the opinion of able lawyers, the stable character of these bonds is not affected by the decision of the court. In fact, the late legislature passed a law validating bonds of this character, as it had a right to do, according to able lawyers. This law is to be found on page 301 of the acts of 1909, and is house bill 114, approved March 6, 1909, and containing an emergency clause. The agitation relating to the gravel road law and its probable unconstitutionality began long before the latest legislature convened, and that body no doubt had in mind the probable or possible action of the highest court in the State when it passed the validating act mentioned.

Senate bill 230, approved March 5, 1909, and found on page 176 of the acts of 1909, is another enactment which provides that, in all cases where boards of county commissioners have constructed or contracted to construct free gravel, stone or macadamized roads, under the act of March 8, 1905, and its subsequent amendments, or to construct county line roads under the act of March 9, 1907, "and have issued bonds of the county that remain unsold under said acts to pay for the cost of the construction of said roads or road, including the contract price, together with the compensation allowed viewers and engineers, expenses of the election, of posting notices of publication, and all other expenses and all the acts and orders of any and all of said boards of commissioners, and any and all bonds issued by them thereunder, and by virtue thereof, whether sold or unsold, be and the same are hereby in all respects legalized and made valid."

This senate bill also contains the provision that the law shall not affect pending legislation and that it shall not be construed to legalize any bonds "in excess of the limitation of four per centum of the assessed valuation of the taxable property of the townships as now provided by law."

From these laws, as passed by the latest legislature, it appears that the bonds now in existence are not affected by the adverse decision of the supreme court on the gravel road law.

# CURRENT INFORMATION

**National Parks—Timber Consumption—Madison Parks—New Boston Charter—Street Cleaning on Sunday—Masks for Street Cleaners—Southern Roads—Tuberculosis from Dust—Newark Paving—Irrigation Statistics—Niagara Falls Water Supply.**

### National Park Where Washington Crossed the Delaware.

A commission was named by Governor Fort, of New Jersey, November 9, to devise a plan of establishing a national park to mark the spot where Washington crossed the Delaware. The commission then organized by electing Frank O. Briggs president and Charles J. Fisk, mayor of Plainfield, vice-president. The organization was followed by a discussion of the best methods for carrying on the work.

### Timber Consumption in 1908.

The total value of the lumber produced in 1908 exceeded $541,000,000, but was 23 per cent. less than that of the previous year's production. The average value at point of manufacture was $15.37 a thousand feet. Yellow pine fell off 15 per cent. Douglas fir 22 per cent., white pine 20 per cent., oak and hemlock 25 per cent. each, and spruce 18 per cent. Louisiana is the leading producer of yellow pine, Washington of Douglas fir, Minnesota of white pine, with Michigan behind Maine and Massachusetts. Oak now comes from Kentucky, Tennessee and West Virginia, and hemlock from Wisconsin, as the leading states.

### Madison Parks.

The Park and Pleasure Drive Association of Madison, Wis., used over $30,000 in improving the parks and drives of the city during the last summer. This association is unique in that it has no political connection with the city government. Although it is separate from the municipal government, the city placed $12,500 in the hands of the association this year to be spent on parks and drives. The remainder of the money spent by the organization was donated by citizens. The work done last season included the erection of a bath house costing $7,500, donated by T. E. Brittingham; a large boat house at Brittingham Park, and other improvements in the park, especially along the lake shore. A new macadamized drive sixteen feet

wide and about a mile long was built from Mineral Point drive through Owen Park. Every part of Tenney Park, which is situated between Lakes Monona and Mendota along the Yahara river, was put in first-class condition. The addition of eighteen acres purchased four years ago has been filled in and sodded and shrubs and flowers planted there. Thirty men were employed during the summer in keeping the association's driveways in repair. The Lake Mendota drives received especial attention. With the coming of the first snow the drives will be closed to the public until spring.

### Boston Chooses the Better Plan of City Government.

A commission system of government, on a non-partisan basis, has just been voted upoon by the city of Boston, which voted down and out partisan convention nominations and ward aldermen. The voters had two plans before them. The one that carried gives the mayor a four years' term, but the voters can recall him in two years if he does not give satisfaction. He must be nominated by a petition of at least 5,000 electors, and no party designation must be placed on the ballot. With him will be a council chamber of nine members, and after the first body is elected, January 11, three will go out of office each year. These ten officials will take entire charge of the business of the city, and if the municipality does not get value received for its expenditure it will be up to the mayor and nine councilmen to explain. The mayor will receive $10,000 and the councilmen $1,500 each yearly.

The plan voted down provided for a mayor with a term of two years; a city council with thirty-six aldermen, nine elected at large and all to be elected in primaries, the ward aldermen for two and the aldermen at large for three years. Ward aldermen were to receive $1,000 and the others $1,500 a year. Political parties were to be preserved in local elections, and the strife between candidates because of national politics instead of because of their national policies was to continue. Both plans provided for various other things.

### Street Cleaning on Sunday.

The trustees of the Ninth Street Christian Church, Washington, D. C., have filed a petition with the District commissioners vigorously protesting against the operation of the street sweepers on Sunday, declaring that the cleaning of the streets on that day proclaims to the world that Washington is a "godless city." They characterize the Sunday work as "unnecessary labor," because the men engaged in it are entitled to a day of rest, the people engaging in religious worship a right to do so without being annoyed by unseemly noises of this nature.

The superintendent of street cleaning, James M. Wood, does not concur in the view that he Sunday work is unnecessary, however, and, on the contrary, declares that it is necessary if the streets of the national capital are to be kept clean. In his report to the District commissioners he says:

This department worked last Sunday and removed from the streets of the city 184 cartloads of leaves and filth. If this work had not been done it would have been impossible to have removed the accumulation that would have been on the streets Monday.

It is proper to add that the only protest against the Sunday work that has reached this department has come from the Ninth Street Church. The writer has been fully advised as to why this Sunday work was done.

It has also been explained by officials of the street cleaning department that work was particularly necessary last Sunday on account of the great quantity of leaves on the streets at this season of the year. The leaf season, it is stated, brings a vast increase in the amount of work to be done by the white wings.

### Gauze Masks for Street Cleaners.

The commissioner of street cleaning has adopted a new hat with sanitary mask of gauze over the mouth and nostrils, to be worn hereafter by the street sweepers of New York City. He says that these sweepers are so often laid off with infectious diseases, undoubtedly contracted from the germs of the street, that it is a matter of departmental economy as well as of humanity to protect them.

### Illustrated Description of Southern Roads in Preparation.

Preparations are being made by the office of public roads, department of agriculture, Washington, D. C., to send an engineer and a photographer through most of the southern states for the purpose of securing data, with explanatory photographs, showing existing status of road building in the south. The investigation, it is expected, will result in the assembling together of much interesting and useful information, not only as to the road building in the south, but the opportunities for improvement.

The itinerary has not yet been definitely determined upon, and it will possibly be subject to changes from time to time after it is laid out, in accordance with requests of various communities desiring to be represented in this government report.

### Tuberculosis Among Workers in Dust.

A bulletin prepared at the bureau of labor in Washington, D. C., by Frederick L. Hoffman, discloses the fact that 25.5 per cent. of the deaths of persons whose occupations expose them to municipal or street dust and to general organic dust is due to tuberculosis.

He gives statistics showing that "in occupations exposed to general organic dust the proportion was 23 per cent. As compared with these proportions, 14.8 per cent.

of deaths were males fifteen years of age and over, and were from consumption. Among occupations exposed to municipal dust those showing the highest mortality were drivers and teamsters, among whom 25.9 per cent. of deaths were from tuberculosis. Among those exposed to general organic dust, buttonmakers showed the highest mortality, 37.8 per cent. of deaths in this occupation being from consumption."

---

**Street Paving in Newark, N. J.**

That the Board of Trade of Newark, N. J., takes an interest in the improvement of the city is shown by the following resolutions passed at various times during the last few months:

STREET PAVING ASSESSMENTS.

*Resolved*, That the board of street and water commissioners are hereby respectfully urged to instruct the legal department to proceed without delay to compel the Barber Paving Company and its bondsmen to fulfill their contract with the city in the laying of a brick pavement on Mt. Pleasant avenue from Clay street to Harvey street, in accordance with contract requirements and tests therein, in order that the board of assessments may proceed with the assessment against property owners for benefits conferred on said highway, thereby relieving the taxpayers of the city at large from being assessed for the large sum involved in the making of this improvement.

*Resolved*, That authority be conferred upon the committee on streets and pavements to present a copy of the foregoing resolutions to the proper bodies and urge consideration and action.

RECUTTING OLD GRANITE BLOCKS FOR USE IN NEW PAVEMENTS.

*Resolved*, That the committee on streets and pavements recommend and urge that the board of street and water commissioners, the common council and other proper officials, take immediate action to have large quantities of old granite blocks recut or redressed during the winter, and sorted into uniform sizes for use in repaving many streets, for which only granite blocks are suited, and have this work done by direct employment of workmen who are citizens of Newark, and by piecework, the city to furnish the few tools and accessory labor needed to remove the granite blocks either to the sides of streets where needed for early repaving, or in some cases to storage places, or municipal property yards, for later use in new pavements and for repaving old ones, all by successful methods used for many years in several cities, and to a limited extent in Newark by the public service corporation, in zones occupied by its tracks.

WOOD BLOCK PAVEMENTS.

*Resolved*, That the committee on streets and pavements recommends that whenever wood block pavements are desired by property owners, and determined by city officials for any street in Newark, that the board of trade insist provision should be made in the contracts and specifications for the widest competition within requirements which will secure economic and satisfactory results.

*Resolved*, That a protest be entered with the board of street and water commissioners against the laying of any wood-block pavements on Market street between the Court House and the Pennsylvania Railroad depot, as against the wishes of the majority of the property owners, and for the reason that a wood-block pavement would seriously interfere, in the judgment of this committee, with traffic, as such pavement is not suited to the needs and wants of this thoroughfare.

---

**Irrigation Statistics in the Next Census.**

Data relative to irrigation projects, both government and private, will comprise a new and important feature of the 1910 census reports. The national irrigation congress has requested the census bureau to collect data regarding the number of acres under irrigation in 1908 and 1909; the crops, their acreage and estimated value for the two years; the number of people engaged in and depending on irrigation for a livelihood; the capital invested in irrigation concerns, and the companies engaged in irrigation in each state. Census Director Durand says:

To the very great number of letters that have been sent to this office relating to the subject I have replied that this bureau will include on its agricultural schedule inquiries for ascertaining the acreage and yield of the various crops that are under irrigation, and the total irrigated area in the United States. I have further added that these inquiries are all that this office is at present authorized to make, and that if congress in its wisdom sees best to authorize the census office to extend the scope of its irrigation statistics, and to collect all the data asked for by the irrigation congress, the bureau of the census will be pleased by such congressional authorization. In so replying to senators and representatives we wish to place upon congress the responsibility for additional investigations relating to irrigation.

---

**Disgraceful Condition of Water Supply of Niagara Falls.**

At a recent session of the conference of sanitary officers of the state of New York, held at Niagara Falls, Prof. W. T. Sedgwick, of the Massachusetts Institute of Technology, severely criticised the conditions at Niagara Falls, saying:

One of the worst plague spots, if not the worst, in respect to typhoid fever, in the United States, is Niagara Falls, in which the death rate from this disease ranged from 109.9 to 186.9 per 1,00,000 in the decade of 1897-1907.

The sewage pollution of Niagara Falls is a matter of national, not merely local concern, for Niagara Falls is visited annually by hundreds of thousands of persons from all parts of the country, many of whom contract typhoid fever there and die of it.

The state of affairs at Niagara Falls is a public disgrace to the state of New York and to the United States of America.

# MUNICIPAL AND TECHNICAL LITERATURE

**Washington Sewage Purification—Washington Filters—Burlington Improvements—Public Utilities Laws—New Publications.**

### Sewage Purification for Washington.

In the annual report recently submitted to the District commissioners by Asa E. Phillips, superintendent of sewers, he urges that early steps be taken to secure the co-operation of the state of Maryland to keep free from sewage pollution Rock creek and the Eastern branch, as a protection to the park system of the national capital, and in the interests of public health and sanitation. He asserts that sewer extension is not keeping pace with the increase of population, owing largely to the costliness of construction in outlying districts in which the city has principally built up.

### Improvements in Burlington, Iowa.

The sum total of $140,747.72 for paving and $48,082.75 for sewers has been expended this year at Burlington, Iowa, making a total of $188,830.47. More than 5 miles of paving—brick block, mineral rubber, asphaltic concrete, tarvia and telford—have been laid, and more than 4 miles of sewers constructed, marking the most advancement in public improvements that has ever before been accomplished in one year in this city.

### Public Utilities Laws of Wisconsin.

The Railroad Commission has recently published a compilation of the laws affecting the regulation of public utilities in that state, most of which, including the main statute, were passed in 1907. One law passed in 1901 is included, and those passed in 1909 affect minor details only, so that the original law will have full opportunity to demonstrate its value.

Another booklet contains a compilation of the laws affecting the regulation of railroads, the first act having been passed in 1905, and many additions and changes in details having been made in 1907 and 1909.

### Cost of Operating Washington Filter Plant.

The report of Brig. Gen. Marshall, chief of engineers of the army, submitted to the secretary of war November 12, deals principally with the purification of the drinking water of the District of Columbia, the improvement of the navigation of the Potomac river, and the reclamation of the flats of the Anacostia river. The estimates submitted for the water supply system include the following: For the operation of the filtration plant, $95,000; operation of Washington aqueduct, $33,000; remodeling Georgetown reservoir and constructing works for the preliminary treatment of Potomac water by means of a coagulant, $130,000; an emergency fund, $10,000. General Marshall also stated that it will cost $936,543 to complete the existing project of the Anacostia river improvement.

### New Publications.

Story of the Session of the California Legislature of 1909. By Franklin Hichborn. 229 pp., cloth, $1.25. The James H. Barry Co., San Francisco, Cal.

The author of this review of methods of legislation is evidently a keen observer, and writes as one with no partisan bias and but little of any other sort except the manifest desire to see the success of measures tending toward good government and the failure of distinctively bad projects. He indulges in a minimum of spectacular condemnation or praise, and impresses the reader with his sanity and conservatism at the same time that he makes plain his position on the side of honesty, competence and progress.

While the book is a history of a particular California legislature, it is a typical legislative story, and the lessons it teaches will be valuable to American citizens everywhere. The machine, as he styles the organized body of men interested in certain lines of legislation and devoted to the passage of laws favoring them and the obstruction of bills which would interfere with them, was in the minority as compared with the unorganized representatives of the people and their interests. The successes and failures of the machine and the methods by which they were attained is the real theme of the book.

The early chapters show how advantages were secured in the organization of both Senate and Assembly, and how organized promotion of a definite candidate for Senator succeeded over the unorganized opposition of a majority which had no definite strong candidate.

The various bills before the legislature are classified into those dealing with moral, political and industrial issues, and the important bills in each of these classes are followed in their course as typical of the

fate of the others of the same classes. These bills, to each of which two to four chapters are devoted, are: Anti-race track gambling, direct primaries, railroad regulation, and a series presented by the Commonwealth Club. There are also chapters on bills favored by the machine. All grades of success and failure are recorded, the reformers being wholly successful with the anti-race track gambling bill, being obliged to accept a direct primary law which had lost most of the valuable provisions with which it started, and an ineffective railroad regulation bill. The Commonwealth Club series of bills relating to grand and trial juries and appeals, mainly in criminal cases, the need for which had been shown in the San Francisco graft cases, were defeated. Of the bills favored by the machine, a vicious change of venue bill, and three others making convictions for crime more difficult, were passed, and the anti-Japanese bills, which were so notorious throughout the country, were defeated.

There are interesting chapters on the lobby and its methods, on the San Francisco delegation, showing the real interest of the state in the character of these men, on the methods and treatment of the notorious Fish Commission, and on the rewards given to the principal adherents of the machine. The whole is an illuminating exposition of the way in which a solid minority, even when largely in the minority, as it was in the Assembly, can secure in large part what it really desires, in the face of many opponents not organized and scattering their support over a number of good measures rather than combining upon a few of the greatest importance.

The later chapters discuss the hold-over senators and the records of the other senators and the assemblymen, and there is an appendix giving the voting records of members on most of the bills discussed, which is a thorough check on the preceding history.

The conclusions state three principal reasons for defeats of the reform majority: that they were without organization, with one exception had no definite plan of action, and permitted the machine to take control of the organization of both branches. It draws lessons for the future, especially that the division upon most questions in a legislature should be between machine and anti-machine rather than upon party lines, following the machine in ignoring differences in party when other interests demand it.

A better statement of the lesson to be drawn would be the adoption of a definite plan of promotion of a public measure or attack of a private bill, but the practical result is the same.

The book is worth careful study by all interested in the processes of legislation.

Ein Neues Schnellbahn-System. Vorschlaege zur Verbesserung des Personen Verkehrs. By August Scherl, Berlin, Germany.

This is an ambitious volume, showing the difficulties in the way of further progress under the present system of railroad transportation and offering a new system, which, it is promised, will solve the problems. The new system is worked out in considerable detail, and includes the monorail system of transportation, the tracks elevated in cities above the roofs of the buildings, on concrete piers running down through them to the ground, belt lines for interurban lines, connecting with belt and radial city lines, and also elevated. Many details of construction of lines, freight and passenger stations, cars, freight handling systems, connections of interurban and city lines with each other and with surface car and cab lines, etc., even to the laying out of a "zone" map for the application of the zone system of railroad fares to Germany. There are some interesting speculations upon the effect of the new system upon the development of cities and country. A table of comparisons of time taken in various journeys under the present and the new systems shows savings of over 50 per cent., many being over 60 per cent.

Oil Tank Tables: How to Calculate Them. By Edwin Squire, City Engineer, Claremont, Cal. 28 pp., paper, 50 cents. Published by the author.

The author of this set of four tables was for many years engaged in the handling of oil from well to refinery, and gives them, as the result of his experience, for the use of others, there being nothing so convenient otherwise attainable. The tables have been thoroughly checked.

The introduction gives directions for measuring an oil tank and making the allowances that observation shows are necessary. This process is illustrated by the notes on the measurement of a tank and the computations to determine its capacity, in tabular form. Table 2 shows corrections to be made to the circumferences for various tapers at various heights. Table 3 shows capacities in barrels of cylinders per foot of depth for circumferences differing by hundredths of feet from 15 to 105 feet, and covers 18 pages.

Two small tables give displacement per 100 linear feet of pipe and timber flumes of given internal and external diameters; also differences between inside and outside circumferences for various thicknesses of staves, the diameter of tanks to which the table applies most closely not being given.

The unpracticed user of the tables will find the lack of explanations a drawback in understanding the small tables and determining the sizes of tanks to which they are most closely applicable.

# ORGANIZATIONS AND INDIVIDUALS

**National Municipal League—Chicago Cement Show—Technical Meetings—Society Proceedings—Civil Service—Technical Schools—Mayors Elected—Personal Notes.**

**Convention of National Municipal League.**

The annual meeting of the National Municipal League was held at Cincinnati, O., Nov. 15, 16, 17, 18 and 19. In his address on "Initiative in the Choice of Elective Municipal Officers," Charles J. Bonaparte said:

When any body governed by elective officers has to provide itself with a new ruler or new set of rules, it is obliged to develop some organ or devise some mechanism which looks up a man or several men believed to be fit for the job and willing to undertake it. The league provides this agency in the form of a committee on nominations. What shall take place and fulfill the purpose of a committee on nominations when a vast municipal corporation, say one of our great American cities, has to choose its ruler by popular vote?

This work can, indeed, be done, either for the party primary or, to my mind, preferably for the entire electorate, by a self-constituted committee or association of citizens. Its value, however, steadily lessens when we try to make it permanent.

I would have every voter appearing on the registration lists to be affiliated with a political party given a blank slip when he receives his official ballot at a legal election, and required to write in his own hand on this slip while he prepares his ballot in the booth, the name of a leader for his party in the city during the next year; these slips would be put in a separate ballot box provided for each party, and publicly counted by the regular officers of election.

The person receiving a plurality of the votes so cast would become the "party leader" for the ensuing year; the three, or perhaps the five, persons receiving the next largest votes after his should make up an "advisory committee" for the same period. The sole duty of the party leader would be to place names on a "regular ticket" at the party's primaries.

The advisory committee should be consulted as to these names, and any member of it who disapproved of any name could have his dissent published. Every facility would be given for "independent" candidacies, both at the primaries and at the final election; the nominees of the party leader would have no other advantage in the former than to be designated as "regular," or by some equivalent title. I do not believe the party leader, chosen as above suggested, would usually be the present local boss; if he were, this would only show that the boss fairly represented the party. In any event, under this system, the party's nominations would be suggested by a representative consciously and intelligently chosen to do this particular work, and the city's voters would know the true value of a nomination as an assurance of fitness.

In the absence of Henry West, Commissioner of the District of Columbia, who was to have delivered an address on the subject of "Billboards in Washington," J. Horace McFarland, president of the American Civic Association, told of the action by the District Commissioners in regard to the billboards in the immediate vicinity of the Union Station, and of the effort which has been made gradually to discourage the general use of billboards in Washington. Among other addresses were the following: "Safe and Sane Fourth," "Street Railways," "Police and Health Regulations," "The Prosecution of Graft," "The Improvement of Water Fronts," "The Influence of Playgrounds and Small Parks on Suburban Development."

With a view to making it a model for all cities of the country, resolutions were adopted asking Congress to approve the estimation of expenses for the National Capital in general, as already approved by the District Commissioners. The resolutions declare:

That the National Municipal League recommends the preparation by our cities of annual budgets, which shall set forth (1) detailed estimates of all proposed expenditures, including those for meeting the cost of buildings and other permanent improvements, as well as those for meeting current expenses; (2) detailed estimates of all expected revenues, and the amount that must be realized from loans to meet, with the expected revenues, the estimated expenditures.

That in the preparation of budgets all statements of revenue shall be given under common heads applicable to all cities, and that all statements of proposed expenditures shall separate those for expenses from those for permanent improvements and outlays, and that both expenses and outlays shall be classified and presented under heads corresponding to those which have been hitherto recommended by the National Municipal League for use in the preparation of uniform municipal reports.

That the National Municipal League hereby expresses its appreciation of the efforts of the Auditor and the Commissioners of the District of Columbia to induce Congress to arrange and classify the appropriations for the District of Columbia according to functional activities, so that the appropriation bill will conform as closely as practicable to the scheme for classifying municipal expenditures hitherto recommended by this league, and by

a large number of other American civic organizations.

That this league respectfully requests Congress to pass the appropriations for the District of Columbia in the general form as approved by this association, to the end that appropriation bills and published reports of our National Capital may be made models for all the cities of the Nation.

The secretary of this league was instructed to transmit a copy of the resolutions to the clerk of the appropriations committee of the House of Representatives and the clerk of the finance committee of the Senate.

Officers were elected as follows: President, Charles J. Bonaparte, of Maryland; secretary, Clinton Rogers Woodruff, of Philadelphia.

---

**The Chicago Cement Show.**

The entire main floor and annex in the Chicago Coliseum have been taken by exhibitors at the Cement show, February 18-26, 1910, about 150 exhibitors securing space and 30 or more being left out. Balcony space will be arranged for these and others. A continuous moving-picture show, showing actual concrete construction, will be a feature of the annex. Many designs are expected in the competition for the concrete centerpiece of the show. Railroad rates of 1½ fares on the certificiate plan will be secured, the exhibition company guaranteeing the necessary attendance of 1,000.

The following conventions will be held at Chicago during the show:

National Association of Cement Users—February 21-25.

American Society of Engineering Contractors—February 24-26.

National Builders' Supply Association—February 23-24.

Illinois Association of Municipal Contractors—February 24-26.

Illinois Lumber Dealers' Association—February 16-18.

Illinois Masons' Supply Association—February 16-18.

Interstate Mantel & Tile Dealers' Association of the United States—February 15-19.

---

**Technical Meetings.**

At the annual convention of the Illinois Mayors' Association, held in Elgin, Ill., in October, the association refused to go on record as endorsing the commission plan of municipal government. A resolution was voted down which declared the sentiment of the association to be in favor of the proposed new form of government, and urged Governor Deneen to include in the call for a special session of the legislature the consideration of a bill granting cities the authority to adopt the commission scheme. After a stormy debate, a substitute resolution was passed omitting the indorsement, and simply asking that the legislature give cities the needful power.

The next convention will be held next year at Cairo. Officers were chosen as follows: President, Mayor Paden; vice president, Mayor W. T. Rawley, of Freeport; secretary, George H. Anderson, of Elgin; treasurer, Dr. F. E. Marstiller, of Geneva.

The fourth international sanitary convention of American Republics will be held in San Jose, Costa Rica, December 25, 1909. Dr. Walter Wyman, chairman international sanitary bureau, Washington, D. C.

The East Tennessee Good Roads Association went on record, at its convention held at Morristown, Tenn., as favoring legislation contemplating the creation of a general goods roads system throughout the state, and for a state highway commission to act in an advisory capacity to county commisisoners and others in charge of road work. It also desired that this commission shall have general supervision over all road construction, with a view to securing conformity in the road-building system. The resolutions also favored national aid in highway construction, and the abolition of the law requiring labor on the roads, and in lieu thereof a direct road taxation was approved. It was finally recommended that in the construction of highways, counties should work with a view to connecting with main roads in adjacent counties, with the ultimate view of creating a system of highways throughout the state. The association decided to create an auxiliary in each county in east Tennessee to aid in the good-roads work. Officers were elected as follows: President, T. J. Hale, of Morristown; vice president, W. A. Park, of Knoxville; secretary, R. O. Gallagher, of Harriman.

The annual meeting of the New Jersey Sanitary Association will be held at Laurel-in-the-Pines, Lakewood, N. J., December 3 and 4. J. A. Exton, 75 Beech street, Arlington, N. J., secretary.

The annual meeting of the Association of American Portland Cement Manufacturers will be held in New York City, December 14 and 15. Percy H. Wilson, Land Title Bldg., Philadelphia, Pa., secretary.

The annual meeting of the Montana Society of Engineers will be held at Butte, Mont., January 6, 7 and 8. Clinton H. Moore, Butte, secretary.

The annual meeting of the Michigan Engineering Society will be held at Lansing, Mich., January 12, 13 and 14. A. L. Holmes, 574 Wealthy avenue, Grand Rapids, Mich., secretary.

The annual convention of the Indiana Engineering Society will be held at Indianapolis, Ind., January 13, 14 and 15. Charles Brossman, Union Trust Bldg., Indianapolis, secretary.

Nominations for officers to be voted upon at the annual meeting of the New England Water Works Association, in January, 1910, have been submitted by the nominating committee, and are as follows:

For president, George A. King, Taunton, Mass.; for vice presidents, Allen Hazen, New York City, Ermon M. Peck, Hartford, Conn., M. F. Collins, Lawrence, Mass., Leonard Metcalf, Boston, Mass., I. S. Wood, Providence, R. I., F. A. McInnes, Boston, Mass; for secretary, Willard Kent, Narragansett Pier, R. I.; for treasurer, Lewis M. Bancroft, Reading, Mass.; for editor, Richard K. Hale, Boston, Mass.; for advertising agent, R. J. Thomas, Lowell, Mass.

At the meeting of the New England Water Works Association, Dec. 8, 2 p. m., at Hotel Brunswick, Boston, Charles F. Choate, Jr., will present a paper on "The Underlying Principles Governing Riparian Water Rights and Diversion Suits." There will be a report of the committee to collect data on awards made for diversion of water and on formulation of standard rules and methods of computing damages from diversion. Eminent lawyers have been invited to join in the discussion. The committee on depth of water pipes and frozen pipes will also report.

At the meeting of the New York Electrical Society held Nov. 30, Albert J. Marshall presented an elaborate illustrated lecture on "The Significance of Public Decorative Lighting," with views of the illumination of the Hudson-Fulton celebration and from various other parts of the country.

The National Association of Cement Users will meet in Chicago Feb. 21 to 25, taking five days for its sessions.

At the Nov. 24 meeting of the Municipal Engineers of the City of New York, Frederick Skene presented a paper on "The New York State Barge Canal."

At the first monthly meeting of the American Society of Engineering Contractors, to be held at the United Engineering Societies Bldg., Wednesday, Dec. 14, at 8:30 p. m., H. P. Gillette will give a paper on "The Science of Management Engineering." D. J. Hauer, Park Row Bldg., New York City, is secretary.

The Civic League of St. Louis is holding a series of Saturday noon luncheons at which subjects of special municipal interest are discussed by out-of-town speakers. On Dec. 4 D. J. Haff, attorney for the Park Board and member of the recent Board of Freeholders of Kansas City, will speak on "The Legal Side of a Park System."

The Play-Ground Association of America wishes to raise at least $25,000 for its work next year. A $10 subscription makes one an associate member for a year. Grace E. J. Parker, 1 Madison ave., New York, is the financial secretary.

At the Nov. 11 meeting of the Brooklyn Engineers' Club Walter E. Spear presented a paper on the present water supply situation in Brooklyn and the prevention of shortage until the new Catskill Mountain supply is available. The library talk on Dec. 2 will be by A. R. Archer on "Sheet Steel Piling."

The American Water Works Association has issued the minutes of proceedings of the recent Milwaukee convention, containing the report of the convention and such of the committee reports and papers as did not appear in the advance copy of papers distributed to members before the convention.

The proceedings of the Cleveland meeting of the National Association of Cement Users fill a volume of 698 pages. It is a compendium of exceedingly valuable information on the use of cement, and is well worth its cost, $3, in paper.

---

### Civil Service Examinations.

The city of Chicago will hold an examination for superintendent of streets in Chicago on December 7, open to candidates from any part of the country. The salary is understood to be $5,000.

The U. S. Civil Service Commission will hold examinations at the usual places as follows:

December 14-15: For mechanical draftsman in engineer department at large, Portland, Ore., at $1,500 a year.

December 15: Two assistant engineers in National Museum, Smithsonian Institution, at $1,080 a year each.

January 5, 1910: Engineer in National Museum, Washington, D. C., at $1,600 a year; also junior engineer draftsman, engineer department at large, at $1,000 to $1,500 a year.

---

### The Technical Schools.

"Fuel Tests with Illinois Coal," by L. P. Breckenridge and Paul Diserens, is issued by the Engineering Experiment Station of the University of Illinois as Circular No. 3. It consists of a compilation of data relating solely to the coals of the State of Illinois, selected from the complete reports of the government investigations on the fuels of the United States, and may be obtained gratis upon application to W. F. M. Goss, director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

The Engineering Society of the University of Nebraska has published the eighth annual volume of "The Nebraska Blue-Print," which contains a number of very practical and instructive papers by alumni, instructors and others.

Bulletin No. 318 of the University of Wisconsin is devoted to the second section of a report on an investigation of centrifugal pumps, made by Clinton Brown Stewart, C. E. It gives much definite information on various phases of the operation of such pumps which have heretofore been somewhat hazy.

The Bulletin of Purdue University, Lafayette, Ind., for October, 1909, gives a full announcement of the winter courses in agriculture.

Rose Polytechnic Institute, Terre Haute,

Ind., has issued a memorial volume at the close of its twenty-fifth year. It includes historical reviews, biographical sketches of the founder, board of managers, past presidents, alumni, accounts of student organizations, addresses, etc., making it a valuable volume to those interested in technical education and in this institution.

The demand for competent teachers of industrial arts has led Teachers' College, Columbia University, to plan a series of night courses, by which young men who have a first-rate technical ability in the trades, such as woodworking or machine shop work, can prepare themselves for the profession of teaching. These courses are being offered at night in the School of Industrial Arts of Teachers' College, covering mathematics, drafting, design, woodworking, machine shop work, industrial chemistry, industrial history, methods of teaching industrial arts. A three years' course of night work will enable an expert mechanic, otherwise qualified, to gain a diploma as teacher of industrial arts.

---

**Election of Mayors.**

Mayors have been elected and re-elected as follows:

New York, N. Y.—William J. Gaynor.
San Francisco, Cal.—P. H. McCarthy.
Salt Lake City, Utah.—Bransford.
Cleveland, O.—Herman Baehr.
Louisville, Ky.—W. O. Head.
Toledo, O.—Brand Whitlock.
Cincinnati, O.—Dr. Louis Schwab.
Columbus, O.—G. S. Marshall.
Canton, O.—Mayor Turnbull.
Indianapolis, Ind.—S. L. Shank.
Muncie, Ind.—Ed Tuhey.
Lafayette, Ind.—G. P. Durgan.
Fort Wayne, Ind.—Jesse Grice.
Wabash, Ind.—James Wilson.
Jersey City, N. J.—Mayor Wirtpenn.
Trenton, N. J.—Mayor Madden.
Bridgeport, Conn.—Buckingham.
Buffalo, N. Y.—L. P. Fuhrman.
Binghamton, N. Y.—J. J. Irving.
Oswego, N. Y.—John Fitzgibbons.
Rome, N. Y.—A. R. Kessinger.
Troy, N. Y.—Elias P. Mann.
Gloversville, N. Y.—W. M. Borst.
Johnstown, N. Y.—A. Harrison.
Utica, N. Y.—Patrick Gillmore.
Rochester, N. Y.—H. H. Edgerton.
Syracuse, N. Y.—Edward Schoenbeck.
Watertown, N. Y.—F. M. Hugo.
Schenectady, N. Y.—Charles C. Duryea.
Elmira, N. Y.—Daniel Sheeman.
Auburn, N. Y.—T. H. O'Neill.
Albany, N. Y.—J. B. McEwan.
Little Falls, N. Y.—Jim Dasey.
South Bend, Ind.—C. L. Goetz.
Mishawaka, Ind.—John Herzog.
Goshen, Ind.—Spohn.
Athens, O.—C. W. Vaughten.
Bucyrus, O.—E. J. Songer.
Chillicothe, O.—Wallace Yaple.
Circleville, O.—C. G. Duffy.
Defiance, O.—C. E. Chenevert.
Galion, O.—H. H. Hartman.
Jackson, O.—John Clark.
Steubenville, O.—T. W. Porter.
Urbana, O.—W. R. Wilson.
Sandusky, O.—J. J. Molter.
Marion, Ind.—George P. Harper.
Norwalk, O.—C. P. Venas.
Akron, O.—W. A. Sawyer.
Mansfield, O.—H. Brown.
Painesville, O.—J. B. Burrows.
Mount Vernon, O.—C. A. Mitchell.
Sacramento, Cal.—M. R. Beard.
Terre Haute, Ind.—Louis Gerhardt.
Richmond, Ind.—Dr. Zimmerman.
Logansport, Ind.—D. D. Fickle.
Vincennes, Ind.—Dr. James D. McDowell.
Gary, Ind.—Thomas E. Knotts.
Warsaw, Ind.—B. F. Richardson.
Rensselaer, Ind.—George F. Meyers.
Valparaiso, Ind.—William F. Spooner.
Columbus, Ind.—James Barnaby.
Elkhart, Ind.—Chester.
Franklin, Ind.—W. G. Oliver.
Attica, Ind.—Reed.
Jeffersonville, Ind.—James E. Burke.
Madison, Ind.—George F. Harper.
Tell City, Ind.—Theodore Kiefer.
Gas City, Ind.—Barney Sullivan.
Seymour, Ind.—Allen Swope.
Frankfort, Ind.—A. W. Edmonds.
Rushville, Ind.—B. A. Block.
Noblesville, Ind.—Dr. E. C. Loehr.
Tipton, Ind.—N. S. Matz.
Connersville, Ind.—Finley Gray.
Alexandria, Ind.—H. Edwards.
Washington, Ind.—John W. McCarthy.
Marietta, O.—Charles F. Leeper.
Hamilton, O.—A. Rothwell.
Portsmouth, O.—Mayor Searcy.
Youngstown, O.—A. W. Craver.
Dayton, O.—Mayor Burchkart.
Newburgh, N. Y.—Benjamin McClung.
Auburn, N. Y.—Thos. H. O'Neill.
Hoboken, N. J.—Robert Davis.
Morristown, N. J.—Theodore Ayers.
Amsterdam, N. Y.—Seely Conover.
Oneida, N. Y.—Otto Pfaff.
Port Jervis, N. Y.—Dr. Chas. N. Knapp.
Memphis, Tenn.—Edward H. Crump.
East Newark, N. J.—Cornelius McClennon.
West Hoboken, N. J.—Charles Mohn.
Bloomington, Ind.—John G. Harris.
Crawfordsville, Ind.—Capt. M. V. Wert.
Cohoes, N. Y.—M. D. Hanson.
Corning, N. Y.—F. A. Ellison.
Fulton, N. Y.—Joseph Connors.
Geneva, N. Y.—Patrick O'Malley.
Kingston, N. Y.—Roscoe Irwin.
Mt. Vernon, N. Y.—F. W. Clark.
New Rochelle, N. Y.—H. E. Colwell.
Yonkers, N. Y.—J. F. Lennon.

---

**Personal Notes.**

C. H. Benck, assistant city engineer at Davenport, Iowa, died November 7.

E. J. Keegan and Allen J. Saville have been appointed assistant city engineers at Richmond, Va.

William B. Smith has been elected city clerk and Jesse Howe city treasurer, at Bloomington, Ind.

Fred Rhodey, of Eagle Harbor, N. Y., has been appointed highway commissioner of the town of Albion, N. Y.

Edward M. Becker has been appointed superintendent of street cleaning, to succeed Charles S. McGinn, at St. Louis, Mo.

James Gardner Sanderson, M. Am. Soc. C. E., of Scranton, Pa., died November 15, in New York City, after an illness of several weeks.

John A. Duntze, assistant engineer, department of docks, New York City, died recently. Mr. Duntze had served the city for 25 years.

P. M. Brickley has resigned as city engineer at Harvard, Ill., and will be succeeded by L. E. Converse, who was formerly his assistant.

James Guthrie, a member of the board of aldermen at Hernin, Ill., committed suicide at his mother's grave, recently, by drinking carbolic acid.

Harrison P. Eddy, M. Am. Soc. C. E., has been appointed a member of the advisory commission for the sewerage system, at Milwaukee, Wis.

Charles A. Hague, consulting engineer, New York City, has been retained to report on increased storage for the water supply of Plattsburgh, N. Y.

C. L. Hutchinson, a former alderman and street commissioner of Bloomington, Ill., died at his home in that city recently, after an illness of two years.

W. F. Martin, Jun. Am. Soc. C. E., engineer U. S. Geological Survey, at Pasadena, Cal., has been appointed chief engineer in charge of water supply investigations in Hawaii.

Henry B. Seaman, chief engineer of the Public Service Commission, First district, New York City, has been appointed consulting engineer for the new subway at Cambridge, Mass.

Henry West has tendered his resignation as Commissioner of the District of Columbia, to take effect December 1, but, urged by President Taft to continue in office until January 1, he consented.

Leonard Metcalf, of the firm of Metcalf & Eddy, consulting engineers, Boston, Mass., has been appointed one of two experts to appraise the property of the Indianapolis Water Co., Indianapolis, Ind.

Henry B. F. Macfarland has resigned as Commissioner of the District of Columbia, which office he has held for more than nine years. Mr. Macfarland desired to leave the office December 1, but at the urgent request of President Taft, consented to continue in it until January 1.

Mayor Haynes, of Minneapolis, Minn., made a recent visit to Syracuse and Albany, N. Y., Portland, Me., Toronto, Ont., Detroit, Mich., and Chicago, for the purpose of investigating municipally-owned electric plants.

W. L. Cooper, manager of Robert W. Hunt & Co.'s European business, sailed November 10 on Red Star steamer Lapland, returning to London after the completion of his annual business trip to the United States.

W. J. Gaynor, of Brooklyn, N. Y., was elected mayor of New York City, November 2. Other officials elected in that city were as follows: Comptroller, William A. were as follows: Comptroller, William A. Prendergast; president board of aldermen, John Purroy Mitchell; president borough of Manhattan, George McAneny; president borough of Brooklyn, Alfred H. Steers; president borough of Bronx, Cyrus C. Miller; president borough of Richmond, George Cromwell; president borough of Queens, Lawrence Gresser.

# MACHINERY AND TRADE

### Cement on the Farm.

The use of cement has become of great interest to the farming classes and a matter of great importance to them. Today the farmer is satisfied only with the safest and most substantial construction about his place. Cheap wooden structures are rapidly being supplanted with stronger and more sightly buildings of concrete. The farmer is using cement for his fence posts, silos, foundations, troughs, well curbs, in drain tile, floors, cisterns, root cellars, dipping tanks, blocks, chicken coops, preserving trees, tanks and even in building his house and outbuildings, to say nothing of the many other smaller uses which need not be enumerated here.

As evidence of the growing importance of cement to the farmer, the following facts may be cited: A very large percentage of all the Portland cement manufactured in the United States is used on farms. In response to a large demand from their subscribers, the agricultural papers the country over are devoting column after column to educational work upon this subject, and many have departments devoted exclusively to the use of cement on the farm. The United States Department of Agriculture publishes bulletins upon the subject and circulates them broadly among the farmers. The State Universities and the Agricultural Experiment Stations give special attention to the subject, and put forth particular efforts to show the farmer the economy and the many advantages of cement construction. The farmers' institutes in the State of Illinois and similar meetings in other States give places upon their programs for speakers upon this subject.

This organized effort to encourage the farmer in the use of cement emanates from bodies who are not pecuniarily interested in the cement business, but it is clearly the result of an active demand for information among the farmers themselves.

During the month of October the Universal Portland Cement Company inserted small advertisements in fifteen of the leading agricultural papers covering territory in the East, Middle West and the Northwest; these brought in return approximately five thousand inquiries from farmers who desired information and instruction on the various uses of cement.

An effort is being made to concentrate and enlarge the exhibits of cement, cement machinery and products at state fairs so that the benefits of the great Chicago show can be extended in less degree

over larger area and to more people. It would seem to be to the interest of the managers of such fairs to provide the necessary facilties for such exhibits.

### A New Cement Plant in Washington.

The Lehigh Valley Cement Company has awarded a contract to the Sylvester Engineering Company to construct a plant capable of developing 10,000 horsepower at Metaline, Wash., to cost between $300,000 and $350,000. The plant will develop the power in Sullivan lake and Sullivan creek, and will be located at the confluence of the creek and the Pend d' Oreille river, above Metaline Falls, where a cement factory to cost $1,000,000 will also be constructed.

A 40-foot dam is to be built at the outlet of Sullivan lake, in which enough water will be stored to maintain an average flow during the dry season sufficient to develop 10,000 horsepower. Another dam, will be built across Sullivan creek, three miles below the lake, and the water of the creek will be turned into a large rectangular flume 6 by 9 feet. This will carry the water three miles further down stream and discharge it into the power plant, where it will take a sheer drop of 450 feet. When this water reaches the cups on the big water wheel it will be traveling at the rate of 100 miles a minute—so fast, in fact, that the entire volume of water coming down the flume forces its way out and into the cups in the form of a jet less than three inches in diameter.

Not all of the 10,000 horsepower to be developed will be used by the cement plant, and the surplus will be sold to the mining companies in the Metaline district.

Mr. Sylvester has already started a crew of men to work making a road to Sullivan lake from the Pend d' Oreille river. The power plant is to be completed in 10 months. Work on the construction of the cement plant has begun. It will have a capacity of 2,000 barrels a day.

The extension of the Idaho & Washington Northern will reach Ione early in November. The extension to Metaline will be made during the winter. The river is to be crossed at the Box canyon.

### Chemical Composition of Liquid Asphalt.

Dow & Smith, chemical engineers, 24 East Twenty-first street, New York City, make the following report of the composition of "Liquid Asphalt," made by the Indian Refining Co., Cincinnati, O., for use in treating macadam roads:

| | |
|---|---|
| Specific gravity at 60 F. | .9314 |
| Equivalent to | 18.7 Be. |
| Flash test (closed tester) | 295 F. |
| Fire test | 365 F. |
| Loss on heating 5 hours at 325 F. | 3.30 per cent. |
| Asphalt contents, 100 pen. at 77 F., (semi-asphaltic) | 65 per cent. |

This oil contains a large percentage of permanent, semi-asphaltic residue that is fairly cementitious and of undoubted value in road making. Its penetrative qualities are good and its consistency is such that in warm weather it will require little or no heating before application. For dust laying and road making purposes we consider that it ranks next to the California oils.

### Trade Publications.

General chain catalog No. 81 of the Jeffrey Mfg. Co., Columbus, O., is devoted to conveying machinery and particularly to chains used in such machinery.

Bulletin No. 18 of the Jeffrey Mfg. Co., Columbus, O., shows the Jeffrey coal cutters and the machinery for driving them.

Monthly Bulletin No. 66 of the Universal Portland Cement Co., describes in particular some reinforced concrete buildings of manufacturing institutions, and gives many photographs of other buildings in which Universal cement has been used.

The monthly "Pipe Parley" of the McWane Pipe Works, Lynchburg, Va., is largely a pocket memorandum book, but it has a market review each month and two or three telling sentences concerning the pipe the firm manufacturers.

The value of "Pioneer Mineral Rubber Pipe Coating" for steel and wonder pipe is set forth in an interesting circular issued by the American Asphaltum and Rubber Co., 600-10 Harvester Bldg., Chicago, Ill.

Vulcanite pamphlets on crazing or hair cracks on concrete surfaces, economical selection and proportion of aggregates for concrete, cement sidewalk paving, an artistic concrete residence and bonding new to old concrete have been received, and will be sent on request to any one interested on application to the Vulcanite Portland Cement Co., Land Title Bldg., Philadelphia, Pa., or Flatiron Bldg., New York City.

Farm Cement News is the title of a series of circulars issued by the Universal Portland Cement Co. No. 5 has a good article on the practical work of laying out and constructing concrete foundations for buildings.

Catalog No. 8 of the Stephens-Adamson Mfg. Co., Aurora, N. Y., makers of elevating, conveying and power transmitting machinery, has been received.

The papers descriptive of the sterilization plant of the Jersey City Water Supply Company at Boonton, N. J., by Dr. J. L. Leal, George W. Fuller and George A. Johnson, read at the last convention of the American Water Works Association, have been published in a pamphlet, probably obtainable of either of the authors.

J. W. Howard, consulting engineer on construction and testing of roads, streets and pavements, 1 Broadway, New York, issues a circular letter detailing his facilities for such work.

Schutte & Koerting Co., Philadelphia, issue circulars descriptive of water-jet

eductors and deep-well water-jet pumps, being sections N and R of catalog 2.

The National Tube Co., Pittsburg, Pa., has issued an elaborate, gilt-edged, leather bound catalog of 470 pages, which is also a fully illustrated price list. It is catalog H, 1909.

The advantages of Sarco as a mineral rubber pipe coating are set forth in detail in an illustrated pamphlet issued by the Standard Asphalt and Rubber Co., 205 LaSalle street, Chicago, Ill.

The Wisconsin Engine Co., Corliss, Wis., sends Bulletin C 4, a handsome illustrated description of their belted type of heavy duty Corliss engines, in a convenient cover arranged to receive future bulletins of the company as they are issued.

---

**Trade Notes.**

ASPHALT.

Spokane, Wash.—Council has concurred in the recommendations of the board of public works for the purchase of a municipal paving plant, and plans and specifications will be prepared at once.

BRICK.

Buttonwood, Pa.—The Diamond Brick Co. will establish a large building and paving brick plant here. The incorporators are: P. H. Kehoe, Wm. Amesbury, D. H. Evans and Arthur Root.

CEMENT.

Hammond, Ind.—The United States Steel Corporation will expend $500,000 for the Universal Portland Cement Co. at Buffington, Ind., to double the size of its present plant. Work will begin in the spring on the new plant.

Quincy, Mich.—The enlargement and improvement of the cement plant is going rapidly forward, but it will take until next spring to complete the plant.

The general sales office of the Marquette Cement Manufacturing Co. has been moved to the works at LaSalle, Ill. The Chicago offices in the Marquette Building will be kept in charge of Mr. Gold Williams, for local sales and the advertising and traffic departments. William Dickinson is the sales manager.

CONCRETE BLOCKS.

Indianapolis, Ind.—The Cement Federal Tile Co., Illinois, has been incorporated here to manufacture and sell reinforced cement roofing tiles, by William Wilhartz, Albert S. Louer and Isadore Wolfsohn.

Union City, Ind.—The Peerless Tile & Manufacturing Co. has been incorporated to manufacture and sell cement products, by J. J. Downing, Addison Steele and John R. Moffett.

Bismarck, N. D.—A. G. Peterson, of Hankinson, N. D., who has a patent on the process of manufacturing cement hollowware, is making an effort to interest capital in the establishment of a plant here.

PURCHASE OF MACHINERY.

Gainesville, Tex.—(Special.)—M. P. Kelly advises us that he is in the market for a steam road roller, a rock crusher and an improved road grader.

Houston, Tex.—(Special.)—Louis G. Hester, C. E., 317½ Main street, is in the market for revolving screens for gravel, and a small crusher.

Weatherford, Tex.—(Special.)—C. W. Camp, superintendent public works, advises us that he is in the market for cleaning rods for sewers.

Waycross, Ga.—(Special.)—Geo. Feltham is in the market for second-hand surveying instruments.

Sioux Falls, S. D.—(Special.)—J. L. Wagner advises us that he desires to purchase municipal grading and contracting machinery.

Pikeville, Ky.—(Special.)—W. T. Griffith advises us that he may want to purchase a second-hand horse roller, 5 to 8 tons.

Normal, Ill.—The advisability of purchasing a street sweeper and sprinkler for the street department is under consideration. Mayor Manchester.

MISCELLANEOUS.

Jersey City, N. J.—The International Filter Co. has been incorporated by Chas. E. Halstead, Edwin B. Proudfit and Hilton D. Belmer.

Dalhart, Tex.—The Dalhart Stone Mfg. Co. has been incorporated by W. B. Slaughter, J. C. Galbraith, C. D. Patterson and Robert Troup.

Chicago, Ill.—The Healy Engineering Co. has been incorporated to construct canals, ditches, aqueducts, bridges, roads, etc., by Robert F. Pettibone, John C. Burchard and Harold S. Osborne.

SEWER PIPE.

Louisville, Ky.—The Louisville Sewer Pipe Co. has been incorporated to buy and sell all kinds of building materials, by Robert E. Brandeis, L. Frankel and F. B. Moses.

---

**Patents Concerning Bridges and Culverts.**

855,986. Concrete Steel Suspension Arch. Edgar J. Schauwecker, Clay City, Ind.

857,505. Bridge Construction. Joseph Weifle, Hamler, O.

866,833. Construction of Concrete Aqueducts, Tunnels, Subways and the Like. James T. Wilson, New York.

867,776. Reinforcement for Concrete Arches. Martin A. Abbott, Chrisney, Ind.

885,386. Bridge Construction (Concrete). Walter Sharp, Eldorado, Kan.

887,189. Concrete Bridge Arch. Milo O. Burnett, Des Moines, Iowa.

890,769. Bridge Construction (concrete). William S. Hewett, Minneapolis, Minn.

891,417. Bridge Construction. Howard Friend, Lexington, Okla.

896,354. Culvert (Sheet Metal). David C. Boyd, Galion, O.

897,416. Culvert and Connection. Julius H. Schlafly, Canton, O.

898,088. Culvert. David C. Boyd, Galion, O.

900,039. Culvert. Julius H. Schlafly, Canton, O.

# IMPROVEMENT AND CONTRACTING NEWS

## PAVING.

Okklahoma City, Okla.—Data are being gathered by active workers in the good roads movement, showing how much work is being done in some counties, and the preparations being made in other counties.

Temple, Tex.—The first block of paving has been completed in First street, between Central and Adams avenues. The cost of the entire block will be borne by the city, owing to the fact that the city owns all the abutting property.

Minneapolis, Minn.—If the mineral rubber pavement which is being constructed in the block between Hennepin and Lyndale avenues, on Kenwood parkway, proves satisfactory in this climate, plans will be made by Theodore Wirth, superintendent of parks, for its extensive use on park boulevards.

Colorado Springs, Colo.—A. J. Lawton, commissioner of public works, and T. L. Waggener, city engineer, who visited Denver and Pueblo, to secure data on street paving, were favorably impressed with bitulithic as a paving material. Wooden blocks will also be recommended for local street paving. City Engineer Waggener's report will be submitted about December 1.

New Albany, Ind.—The Barber Asphalt Paving Co. has asked for a writ of mandamus in the federal court to require this city to take steps to levy and collect a tax or to otherwise provide a fund for the payment of certain money alleged to be due the company for the paving of East Main street. The complaint alleges that the company got judgment against the city for $69,460, all of which has been paid except $4,068.90, and that the city is taking no steps to make final settlement.

### CONTEMPLATED WORK.

Garrison, N. D.—Paving is contemplated for Main street.

Cottage Grove, Ore.—This city contemplates paving Main street.

Puyallup, Wash.—The city council has decided to pave West Pioneer avenue.

Hancock, Minn.—The construction of cement walks will be authorized next spring.

Aurora, Ill.—Paving is contemplated for a large number of streets next spring.

Salem, Ore.—This city contemplates 35 blocks next year.

Key West, Fla.—The citizens voted to issue $140,000 bonds for street improvements.

Ellensburg, Wash.—An ordinance has been passed providing for the macadamizing of Third street.

Clarinda, Iowa.—The construction of a macadam road 21 miles in length is contemplated.

Pocatello, Idaho.—Plans have been completed for paving the principal business streets.

Bremerton, Wash.—The construction of cement sidewalks in the business section is contemplated.

Stillwater, Minn.—Council is considering the question of paving Third street with brick or granite.

Canandaigua, N. Y.—About 1 mile of road across the foot of Canandaigua lake is to be macadamized.

Missoula, Mont.—Plans have been prepared for the immediate construction of half a mile of cement walks.

Shawnee, Okla.—About $40,000 will be expended for constructing 28,000 square yards of asphalt paving.

Indianapolis, Ind.—A resolution has been adopted for paving Thirty-fourth street from Meridian street to Central avenue.

Virginia, Minn.—The question of paving several residence streets next year with tar macadam is being considered.

Faribault, Minn.—Council has appointed a committee of citizens to investigate creosoted wood-block pavements.

Omaha, Neb.—A petition has been presented to council, asking that a number of streets in Dundee be paved.

Tacoma, Wash.—Council voted to construct cement sidewalks in local improvement district No. 62, at a cost of $2,799.

Beloit, Wis.—This city contemplates constructing about 50,000 square yards of paving. Robert Caldwell, city engineer.

Kent, Wash.—The city council proposes to pave with brick, with concrete curbs and gutters, at a cost of $15,000.

Lincoln, Neb.—Council has decided to let contracts next spring for about $50,000 worth of paving.

Jackson, Ga.—The question of issuing bonds for the improvement of public roads and building bridges, will be voted on December 11.

Duluth, Minn.—A petition has been submitted to the board of public works for paving East Fourth street from Fourteenth to Twenty-third avenues.

Sioux Falls, S. D.—Council voted to construct cement curb and gutter in Sixth, Seventh and Eighth streets, and cement sidewalks in Seventh street.

Peoria, Ill.—A public hearing will be held December 1, on the resolution to pave Elizabeth, St. Mary and Sabella streets with vitrified brick.

Bloomington, Ill.—The property owners in West Washington street, from Madison street to Roosevelt avenue, have petitioned for asphalt resurfacing.

Everett, Wash.—The city engineer has been directed to prepare plans and specifications for paving Grand avenue and others with brick or asphalt.

Chicago, Ill.—The South Park commission has recommended a plan for transforming Michigan avenue between Jackson boulevard and Randolph street, into a boulevard.

Pittsburg, Pa.—Mayor Wm. A. Magee has authorized the engineers to survey South Eighteenth street extension so that the street can be opened for widening and paving.

Wausau, Wis.—The city engineer will submit a report to the city council at the first meeting held in December, on the cost of paving Third, Scott and Washington streets.

Oakland, Cal.—Resolutions have been

adopted providing for the construction of sidewalks in portions of Thirty-ninth, Fortieth, Montgomery, Jackson, School, Sixty-second and Canning streets.

Ventura, Cal.—The property owners will expend about $7,000 in the improvement of Beach road, between this city and Santa Barbara. Casitas boulevard will also be improved.

Boston, Mass.—The street department has been granted authority to construct a macadam roadway in Beaumont street; to resurface Cushing and Sawyer avenues and Poplar street; to macadamize Hobart street.

Albany, N. Y.—Bids will be received during December, January and February for constructing a large number of state and county highways. Irving J. Morris, secretary state highway department.

Columbus, Miss.—(Special.)—Chas. L. Wood, C. E. and surveyor, says this city contemplates paving the streets in the business district. The material has not yet been decided upon. E. S. Donnell, mayor.

Peoria, Ill.—Ordinances have been approved for paving Hayes street with brick and for resurfacing Hamilton street with asphalt. The estimated cost of paving Adams street with creosoted wood blocks is $38,192.

Burlington, Iowa.—Council will take action December 6 on the proposed grading and curbing with artificial stone and paving with brick in Eighth street. Granite paving is also contemplated for two blocks of North Main street.

Charleston, W. Va.—The good roads committee of the Charleston Automobile Club has begun a movement to interest the counties between Charleston and Columbia in improving the roads in their respective counties, so as to establish a good roadway between the two cities.

Racine, Wis.—Paving is proposed for Douglas and other streets. Estimates for resurfacing Washington avenue from Asylum avenue to Twelfth street, 13,280 square yards, are as follows: Crushed stone only, $3,320; stone with oil, $4,648; stone with tarvia, $5,312; stone with asphalt, $9,296.

### CONTRACTS TO BE LET.

Bellingham, Wash.—Bids are asked until December 8 for grading roads. Board county commissioners.

Delphi, Ind.—Bids are asked until December 6 for constructing two roads. M. G. Haus, county auditor.

Muncie, Ind.—Bids are asked until December 8 for paving E. S. Clark road with brick. J. Q. Potter, engineer.

Vincennes, Ind.—Bids are asked until December 7 for constructing four gravel roads. J. T. Scott, county auditor.

Fowler, Ind.—Bids are asked until December 7 for constructing 16 roads. Laurel Shipman, county auditor.

Madison, Ind.—Bids are asked until December 7 for constructing a road. Gaylord F. Crozier, county auditor.

Wabash, Ind.—Bids are asked until December 7 for constructing a gravel road. J. P. Noftzger, county auditor.

St. Paul, Minn.—Bids are asked until December 9 for improving Otter Lake road. Edw. C. Kræmer, county auditor.

Peru, Ind.—Bids are asked until December 8 for constructing three gravel roads. Chas. Griswold, county auditor.

Boonville, Ind.—Bids are asked until December 6 for constructing three gravel roads. Ray F. Cherry, county auditor.

Ft. Meade, S. D.—Bids are asked until December 6 for constructing roads, sidewalks, gutters and drains. Construction Q. M.

Greensburg, Ind.—Bids are asked until December 6 for constructing a macadamized road. Frank E. Ryan, county auditor.

Tipton, Ind.—Bids are asked until December 6 for constructing seven gravel or stone roads. J. F. Barlow, county autitor.

Crawfordsville, Ind.—Bids are asked until December 7 for constructing a road. Bennett B. Engle, county auditor.

Lebanon, Ind.—Bids are asked until December 13 for constructing sidewalks in Park street. Edmund Connor, county clerk.

Rockville, Ind.—Bids are asked until December 7 for constructing a gravel road. H. A. Henderson, county auditor.

Laporte, Ind.—Bids are asked until December 8 for constructing a macadamized road. Chas. H. Miller, county auditor.

Houston, Texas.—Bids are asked until December 13 for paving Jacinto, Main and Travis streets and Washington avenue with brick. Mayor Rice.

Huntsville, Ala.—Bids are asked until December 7 for constructing 100,000 square yards of asphalt paving on concrete base. D. B. Lillard, city clerk.

Aitkin, Minn.—Bids are asked until December 3 for raising the grade at both ends of the White Pine bridge across Snake river. J. B. Lemire, county auditor.

Bloomington, Ill.—Sealed bids are asked until December 2 for paving Clinton and Graham streets and University avenue with brick, with stone curbing. R. L. Carlock, chairman board of local improvement.

Vicksburg, Miss.—Bids are asked until December 6 for paving 15 blocks of streets with vitrified brick, granitoid, bitulithic, asphalt, mineral rubber, and creosoted wooden blocks. C. R. Twiss, city engineer.

Indianapolis, Ind.—Bids are asked until December 6 for paving Thirty-third street from Meridian to Illinois with wooden blocks, asphalt, bitulithic or brick, and the sidewalks with cement. Joseph T. Elliott, chairman board of public works.

Piper City, Ill.—Bids are asked until December 18 for 8,231 square yards of vitrified brick paving; 2,572 lineal feet of sandstone curb; 160 feet of false curb; sewer pipe, drain tile, catch-basins, etc. N. G. Plank, city clerk.

New York City.—Bids are asked until 3 p. m., December 2, for constructing and completing the cement walks around Parade Ground building, Prospect Park, Brooklyn, which is the abandoned contract of Frank J. Tyler. Park Board.

Kendallville, Ind.—Bids are asked until December 7 for 21,000 square yards of street paving, with sheet asphalt, brick, bitulithic, or creosoted wood blocks, and 8,000 feet of cement curbing. William P. Myers, city clerk.

Macon, Mo.—Bids are asked until Dec. 6 for constructing granitoid sidewalks in Rutherford st. E. W. English, cy. clk.

San Rafael, Cal.—Bids are asked until Dec. 6 for grading and macadamizing 2,400-ft. of road in road dist. No. 10. R. E. Graham, clk. bd. supvrs.

### CONTRACTS AWARDED.

Peoria, Ill.—The contract for paving Pacific street with brick was awarded to A. D. Thompson, for $7,506.

Pratt City, Ala.—The contract for constructing sidewalk improvements was awarded to the Tissue Pacing Co.

Cameron, W. Va.—The contract for paving the Green Valley road has been awarded to M. McFadden, of Moundsville.

Delphi, Ind.—The contract for constructing a gravel road was awarded to James F. Pierce of this city, for $5,100.

St. Clairsville, O.—Moore & Strain secured the contract, November 3, for macadamizing 1.96 miles of road, for $9,143.

Newcastle, Ind.—The contract for constructing 1,900 feet of gravel roadway was awarded to Edward Payne for $1,975.

Marion, Ind.—The contract for constructing 3 miles of gravel road in Monroe township was awarded to J. W. Sullivan, for $9,945.

Knoxville, Tenn. — The contract for grading Pritchard and Ninth streets was awarded to C. O. McCarley, at 47½ cents a cubic yard.

Salt Lake City, Utah. — The Kennedy Construction Co. was awarded the contract for paving Third street south for $147,852.09.

Reading, Pa.—The contract for constructing 1,400 square yards of Perkiomen avenue was awarded to John K. Faust, at $1.85 a square yard.

St. Joseph, Mo.—The contract for paving Albermarle street with brick was awarded, November 19, to R. O. Rinehart, at $1.35 a square yard.

St. Paul, Minn.—The contract for paving Tenth street with vitrified brick was awarded, November 2, to Fielding & Shepley, for $15,378.

Huntsville, Ala.—The contract for 1½ miles of Holmes street with granitoid block was awarded to the R. S. Blome Co., of Chicago.

Jennings, La.—The contract for constructing concrete sidewalks and curbing was awarded to De Jersey & Barnard for about $30,000.

Birmingham, Ala.—The E. W. Jordan Contracting Co. was awarded the contract for 23,500 square yards of brick paving, Nov. 4, at $1.84 a square yard.

Claremore, Okla.—A contract for constructing about 1 mile of brick paving was awarded to the New State Construction Co., of Tulsa, Okla.

Dallas, Tex.—The contract for paving Poydras street with brick was awarded to the Texas Bitulithic Co., at $2.27 a square yard, or a total of $6,538.

Guthrie, Okla.—Contracts for constructing about 2 miles of additional asphalt paving were awarded to J. F. Hill, at $1.96½ and $1.94½ a square yard.

New Castle, Ind.—The contract for constructing East Broad street with macadam was awarded, for $12,666.89.

Vicksburg, Miss.—The Southern Paving & Construction Co., of Chattanooga, Tenn., awarded the contract for paving First North street with brick, at $2.18 a square yard.

Pensacola, Fla.—The contract for construction of cross-walks over the grass plots on all streets was awarded to the Whidden Construction Co., November 16, for $4,950.

Joplin, Mo.—The contract for constructing cement sidewalks, with concrete curbs and gutters, in Joplin street and Galena avenue, was awarded to J. S. Riley, for $7,638.56.

Ashland, Ky. — The contract for constructing 34,000 square yards of bitulithic paving and 22,000 lineal feet of concrete curb and gutter, was awarded to the Southern Bitulithic Co., of Nashville, Tenn., for about $450,000.

Salt Lake City, Utah.—Bids were submitted Nov. 5, for paving extension ..o. 61, as follows: Strange & Maguire, $76,493.08; P. J. Moran, $78,022.94; Bryant & McLaughlin, $80,776.63; Barber Asphalt Paving Co., $81,694.60.

Indianapolis, Ind.—Contracts for constructing cement walks and curbing have been awarded as follows: Kennington street, Henry Maag, $1.04; Ruckle street, Lackey Bros., $1.09; Harlan street, Marion Caldwell, $1.19; Washington street, M. Sapirie, 57 cents.

Cincinnati, O.—Contracts for street improvements were awarded November 10, as follows: Paving Wilder street with brick, McCarthy Bros., $14,650; Rose Hill and Beechwood avenue, with wooden blocks, Rissell & Jennison, $58,862; Russell avenue, brick, Wm. Scully, Jr., & Bro., $11,719; Gilbert avenue, brick, McCarthy Bros., $19,967.

Columbus, Miss. — The contract for working all roads west of the Tombigbee river was awarded to Collier Hardy at $40 per mile for first-class and $20 per mile for second-class roads. Bennette & Shackleford secured the contracts for the roads east of the river at $37.50 and $32.50 per mile, respectively, for first and second-class roads.

Flemington, N. J.—Contracts for constructing 15 miles of macadam roads were awarded, Nov. 17, to the Delaware River Quarry & Construction Co., of Lambertville, as follows: Ringoes-Woodville, $35,756.59; Spring Mills-Frenchtown road, $34,380.16; Whitehouse-Lebanon road, $51,173.45, with trapite binder, and $39,381.13 with asphaltum binder.

Oklahoma City, Okla.—The Cleveland Trinidad Paving Co., of Cleveland, O., has been awarded paving contracts as follows: Third street, $14,458.50; Hudson avenue, $98,407.25; Classen boulevard, Thirty-seventh street, $101,244.59; Thirty-fourth street, $25,254.75; Lindsey avenue, $10,153; Durland avenue, $13,373.25; Laird avenue, $13,507; Oklahoma avenue, $8,188.70; Flynn, Barnes and Tenth streets, $23,412.75; Robinson avenue, $82,792; Twenty-first and Twenty-second streets, $12,348.25; Tenth street, $10,378.50; total, $417,946.35.

## SEWERS.

### CONTEMPLATED WORK.

Ramona, Okla.—Voted to issue bonds for constructing sewers.

Tama, Ia.—Plans are being prepared for constructing a sewer here.

Mandan, N. D.—A sewerage system is contemplated for this city.

Auburn, Ind.—A sewerage system is contemplated. J. F. McDowell, engineer.

Bakersfield, Cal. — Plans and specifications have been prepared for a sewage tank.

Big Stone Gap, Va. — Voted to issue bonds for constructing a sewerage system.

Chatfield, Minn.—The installation of a sewerage system is contemplated.

Winchester, Va.—Voted to issue bonds for the construction of a sewerage system.

Tuscaloosa, Ala.—Voted to issue $25,000 bonds for constructing a sewerage system.

Brownsville, Tex. — A contract will be let soon for constructing a sewerage system.

Parsons, Kas.—The construction of a septic tank and filter beds is contemplated.

Winchester, Ky.—This city voted to issue bonds for constructing a sewerage system.

Hawarden, Ia.—Plans are being prepared for a sewerage system, with a septic tank.

Garden City, Kas. — Preliminary plans for a sanitary sewer system are being made.

Oaklyn, N. J. — The State Board of Health has approved plans for a purification plant.

Rahway, N. J. — The State Board of Health has approved plans for a sewerage system here.

Dublin, Ga.—This city voted to issue $40,000 bonds for constructing a sewerage system.

Collins, Okla.—Voted to issue bonds for constructing a sewerage and waterworks system.

Columbus, Ga.—The construction of a complete sanitary sewerage system is contemplated.

Syracuse, N. Y.—A system of sewers for the drainage of the First and Second wards is contemplated.

Hamilton, Ont.—The estimated cost of the proposed West End sewer and disposal works is $110,000.

Highland Park (Richmond P. O.), Va.—Plans are being prepared for constructing a sewerage system.

Manchester, Va.—The estimated cost of constructing a sewerage system at Forest Hill is $25,000.

Hilton, N. J.—The property owners have decided to ask for the construction of lateral sewers.

Andrews, N. C.—This city has decided to construct a sewerage system. H. N. Wells, mayor.

Belle Plaine, Ia.—The city council decided, November 20, to construct 4 or 5 miles of sewers.

Maywood, N. J.—Plans for a sewer system and a sewage-disposal plant will be made by Fred Page.

Ft. Wayne, Ind.—The construction of a large sewer in Potomac and Thomas streets is contemplated.

Binghamton, N. Y.—Plans have been completed for the proposed Helen street sewer. John A. Giles, mayor.

Mt. Sterling, Ky.—The question of issuing bonds for constructing a sewerage system was favorably voted on.

Webb City, Mo.—Plans and specifications have been prepared for the first stone sewer to be built in this city.

Garnett, Kas. — Plans have been prepared for constructing vitrified, concrete and pipe sewers. M. D. Pilkington, city clerk.

Canby, Minn.—Plans have been completed for constructing a sewerage system here, and bids will be received after January 1.

Sebring, O.—Bids are asked until December 15 for constructing a sanitary sewerage system and disposal plant.

Jackson, Miss.—The city council has authorized a bond issue for the construction of sewers. A. C. Crowder, mayor.

Warren, O.—Alexander Potter, consulting engineer, New York City, estimates the cost of constructing storm and sanitary sewers.

Alton, Ill.—The construction of the East End trunk sewer system is being considered by the board of local improvements.

Little Rock, Ark. — Ordinances have been passed for constructing sewer systems in Districts Nos. 8 and 60. J. H. Tuohy, mayor.

Charlotte, N. C.—The construction of sewers in North Brevard, East Fourth and North Tryon streets has been authorized by the board of aldermen.

Rochester, N. Y.—Ordinances have been adopted for constructing sanitary and storm-water sewers in Humboldt street and University avenue.

Bedford, O.—The board of trade is making an effort to secure a good sewerage and waterworks system for this village. President Wheelock.

Missoula, Mont.—The report of Special Engineer Swearingen for the proposed municipal sewerage system has been adopted. Mayor Logan.

Columbia, Tenn. — Surveys and estimates for constructing a sewerage system will be prepared by Walter G. Kirkpatrick, consulting engineer, of Jackson, Miss.

Barrington, Ill.—A sewerage system is contemplated, but no definite action toward its construction has yet been taken. E. T. Kirkby, village clerk.

Provo, Utah.—Protests will be heard December 9 on the resolution creating sewer district No. 12, which includes nearly all of the west portion of the city.

Tarentum, Pa.—The state health commissioner has approved plans for a combined trunk sewer line and sewage-disposal plant, for this and Brackenridge boroughs.

Daytona, Fla.—The introduction of an ordinance in council is proposed, which provides for the issue of $50,000 for the construction of a sewerage system.

Sharpsburg, Pa.—The officials of this city, Etna, Millvale and Aspinwall are considering the construction of a sewage-disposal plant, to be paid for jointly.

Newman, Cal.—This town voted to issue bonds for constructing a sewer and septic-tank system. Plans and specifications will be prepared by Chas. E. Sloan, consulting engineer.

Keyport, N. Y.—This city has retained Clyde Potts, 30 Church street, New York City, to design a sewerage system and disposal plant. Cornelius Akerson, secretary sewerage commission.

Columbus, Ind.—The estimated cost of the proposed sewer system in the eastern part of the city, to be known as the Maple Grove sewer, is $28,898.22. Wm. H. Rights, city engineer.

Pittsburg, Pa.—A metropolitan sewerage district, comprising this city, McKeesport and all of the boroughs in the Monongahela and Allegheny valleys, is being discussed. Wm. A. Magee, mayor.

### CONTRACTS TO BE LET.

Greenfield, Ind.—Bids are asked until December 6 for constructing a sewer. Chas. H. Troy, county auditor.

Iowa City, Ia.—Bids are asked until May 6 for constructing a sewer in Walnut street.

Carson City, Nev.—Bids are asked until Dec. 13 for constructing a sewer in Plaza and Rice streets. E. O. Patterson, city clerk.

Trenton, N. J.—Bids are asked until December 7 for constructing sewers in Hoffman street and West End avenue. Harry B. Salter, city clerk.

Crawfordsville, Ind. —Bids are asked until December 8 for constructing an 8-inch sanitary sewer in Hocum street. H. B. Hulett, city clerk.

Brooklyn, N. Y.—Bids are asked until December 8, for constructing and reconstructing sewers in various streets. Bird S. Coler, president borough.

Washington, D. C.—Bids are asked until December 6 for constructing sewers in the District of Columbia. H. B. MacFarland, chairman District commissioners.

New York City.—Bids are asked until December 6 for constructing sewers and appurtenances in various streets. John F. Ahern, president Manhattan borough.

Great Bend, Kas.—Bids are asked until December 7 for constructing a sanitary sewer system and appurtenances. W. K. Palmer Co., engineers, Dwight Bldg., Kansas City, Mo.

Elmwood, O.—Bids are asked until December 10 for constructing sewers, sewage-disposal works, flushing tunnels,

drains, ditches and appurtenances. T. T. McQueen, village clerk.

Urbana, Ill.—Bids are asked until December 4 for a main open and tile drain, and several tile spur or branch drains. L. C. Wyckoff, chairman commissioners. Union district No. 2, towns of Somer and Stanton.

Dallas, Tex.—Bids are asked until December 13 for constructing sanitary sewers in the Fifth ward, requiring 3,065 feet 30 inches, 2,850 feet 24 inches, 1,375 feet 20 inches, 11,151 feet 15 inches, 1,552 feet 12 inches and 1,450 feet 10 inches vitrified pipe, with manholes and flush-tanks. H. B. Rice, mayor.

Payette, Idaho.—Bids are asked until December 9 for constructing a sewerage system in district No. 1, requiring 4½ miles of 6 to 15-inch pipe, with necessary appurtenances. I. R. Woodward, chairman sewer committee.

Storm Lake, Ia.—Bids are asked until December 7 for constructing 8½ miles of 8 to 15-inch sanitary sewers and a disposal plant. Chas. P. Chase, of Iowa Engrg. Co., Clinton, consulting engineer.

Louisville, Ky.—Bids are asked until Dec. 17 for constructing 2,180 feet of 60-inch reinforced concrete sewer and 1,566 feet of 48 and 39-inch unreinforced concrete sewer, including 3,746 feet of earth excavation, about 970 cubic yards of reinforced concrete, 520 cubic yards of unreinforced concrete, and 60,000 pounds of steel reinforcement. P. L. Atherton, chairman, sewerage commissioners.

Wichita, Kas. — Bids are asked until December 6 for constructing the College Hill sanitary system, requiring 5,300 lineal feet 45-inch double-ring brick or reinforced concrete block or tile sewer; 11,837 feet 42-inch brick, reinforced concrete block or tile; 2,793 feet 39-inch brick, reinforced concrete block or tile; 3,963 feet 36-inch brick, reinforced concrete block or tile; 3,870 feet 30 inches brick, reinforced concrete block or tile; 1,356 feet 24 inches brick, reinforced concrete block or tile; 1 outlet protection; 1 special creek crossing; 87 manholes. Wm. Sence, city clerk.

### CONTRACTS AWARDED.

Joliet, Ill.—The contract for constructing sewers in Henry, Akin and Hobbs avenues was awarded to C. R. Spears.

Hastings, Neb.—The contract for constructing 15,293 feet of sewers was awarded to H. C. Gardner, of Lincoln, for $11,290.

Little Rock, Ark. — Joseph McCoppin was awarded the contract for constructing a sewerage system in district No. 56, on November 5.

Altoona, Pa.—The contract for relaying 756 feet of sewer in Twenty-second avenue was awarded, November 5, to J. L. Wilson, at 80 cents a lineal foot.

Cedar Rapids, Ia.—Dearborn & Jackson secured the contract for constructing a sanitary sewer in Young's Hill district, for $39,574.

Bloomington, Ill.—The contract for constructing the Kickapoo drainage ditch was awarded to Templeton & Hamilton, at 6.25 cents a cubic foot.

Maple Creek, Sask.—The contract for installing sewage pumping equipment was awarded to A. P. Burns, of Medicine Hat, Alberta, for $20,900.

Pratt City, Ala.—The E. W. Jordan Construction Co., of Birmingham, Ala., was awarded the contract for constructing sanitary sewers, for $19,760.

Provo, Utah. — The contract for constructing a sewer in district No. 11 was awarded to the James Kennedy Construction Co., of Salt Lake City, for $56,349.27.

Vancouver, Wash.—The contract for constructing sewers in Grant, Harvey, Ingalls and Jefferson streets, was awarded, November 1, to the Cascades Contract Co., for $17,569.

Youngstown, O.—The contract for constructing a sewer in Byron street was awarded to S. H. DeGroot, and for the Carr, Hawn and Avers streets district sewer to Gartland Bros.

Green Bay, Wis.—H. O. Schaefer was awarded the contract for constructing a sewer in South Broadway, at 74 cents a lineal foot, and C. P. Flatley secured the contract for a sewer in Elm street at $1.06 a lineal foot.

Salt Lake City, Utah.—The Kennedy Construction Co. was awarded sewer contracts, as follows: Extension No. 228, $1,101,832.10; No. 225, $17,503.20. Zerbe & Walker secured the contract for installing a weir in City Creek for $500.

Chattanooga, Tenn. — The contract for constructing the Chattanooga creek system of intercepting sewers was awarded to the Noll Construction Co., of this city, for $48,452.81. I. C. Mishler secured the contract for constructing the small-pipe sewers in various streets, for $4,299.60.

Rome, N. Y.—Bids were submitted November 1 for constructing a sewage-disposal plant at the Rome State Custodial Asylum, as follows: Scott & Gleason of Ilion, $6,800; Wing, Reixinger & Wing of Buffalo, $7,600; A. E. Stephens Co. of Binghamton, $7,700; Rocco Peretta Co. of Utica, $7,799; New York Sewage Disposal Co., $8,561; Chas. T. Hookway of Syracuse, $8,874; Corey Construction Co. of Rome, $9,826; Rome Construction Co., $10,073; Thomas & Watkins of Woodbury, N. J., $11,627; G. Amotonia Riengo of Rome, $13,388.

## WATER WORKS.

Atlanta, Ga.—The new water works pumping engine will be officially tested Dec. 1.

Dallas, Tex.—The Bronx Park Water Co. has been incorporated by Eli Sanger, Israel Dreeben and E. Milliken.

Canadian, Tex.—The Canadian Water, Light and Power Co. has been incorporated by Avery Turner, J. E. Hurley, A. L. Conrad and H. E. Hoover.

Jersey City, N. J.—The Great Falls Power Co. has been incorporated to sell water, water rights and privileges, by W. C. Parke, L. J. Relyea and F. E. Griswold.

Qhincy, Ill.—The newly elected board of trustees of the Citizens' Water Works Co. has organized by electing officers as follows: President, W. H. Govert; secretary, Theodore B. Pape; treasurer, H. C. Sprick.

New Castle, Del.—The plant of the New Castle Water Works Co. was sold at receivers' sale, Nov. 4, to George H. Schaefer, H. E. Ahrons, James E. Ahrons and John Bowman, all of Reading, and Wm. J. Yeager, of Lewistown, Pa.

Rock Hill, S. C.—The Rock Hill Water & Electric Co. has been incorporated to conduct a general power, light and water business. A. P. Mallory is president; R. T. Fewell, vice-president; J. S. Mitchell, secretary; L. C. Ritchie, treasurer.

### CONTEMPLATED WORK.

Vaiden, La.—Voted to construct a water works system.

Coldwater, Ont.—A water works system is contemplated.

Tunica, Miss.—A water works system is contemplated.

Casey, Ill.—This city has decided to install a pumping plant to furnish water.

Batesville, Ark.—The construction of a water works is contemplated.

Miles City, Mont.—A new water works system is contemplated.

Park City, Utah—Plans have been adopted for the proposed water works system.

Merrill, Ia.—The installation of a water works system is contemplated.

Verona, N. J.—Council has decided to purchase land and erect a standpipe.

Kenesaw, Neb.—Will vote on the issue of bonds for constructing a water works system.

Morehead City, N. C.—This city contemplates the construction of a water works system.

Miles, Tex.—Voted to issue bonds for constructing and maintaining a water works system.

Westernport, Md.—Preliminary surveys are being made for a water works system for this city.

Miles City, Mont.—The question of constructing a water works system is being discussed.

Ralston, Okla.—The construction of water works and electric light systems is contemplated.

Center, Tex.—Voted to issue bonds for the extension and improvement of the water works system.

Kenosha, Wis.—The water comrs. have decided to construct a new intake to cost about $90,000.

Harlowton, Mont.—The question of constructing a water works system is under consideration.

Utica, N. Y.—A municipal water works system is being urged for this city by the local press.

Erie, Kas.—Voted to issue $50,000 bonds for constructing a water works and electric light system.

Coin, Ia.—The construction of water works, sewers and electric light plants is contemplated.

Cushing, Okla.—Voted to issue bonds for constructing water works. C. W. Dutton, cy. clk.

Trail, B. C.—The estimated cost of a water works system is $25,000. W. E. B. Moneypenny, cy. clk.

Centralia, Mo.—Will vote again on the question of issuing bonds for the construction of water works and sewers.

Conway, Ark.—A petition has been presented to the city council asking for the organization of a water works district.

Renton, Wash.—Will vote Dec. 7 on the issue of $12,000 bonds for completing the municipal water works.

Wilmington, N. C.—Additional contracts will be let soon for the reconstruction of the water works system.

Newington, Conn.—The Newington Water Co. is considering the question of increasing the water supply.

Sacramento, Cal.—The estimated cost of the proposed filtration system is $660,000. Geo. N. Randle, cy. engr.

Hollister, Cal.—(Special)—W. N. Bruce, P. O. Box 294, advises us that he is in the market for 4 to 14-in. c. i. pipe.

Leon, Ia.—The Iowa Engineering Co., of Clinton, estimates the cost of a water works system for this place at $29,900.

Jackson, Miss.—Bonds will be issued for water works improvements, including a purification plant. B. H. Klyce, cy. engr.

Dustin, Okla.—The construction of a water works system is contemplated. Plans have not yet been made. F. P. Hicks, town clk.

Pella, Ia.—The Iowa Engineering Co. has been selected to supervise the construction of a water works and electric light plant.

Geneseo, N. Y.—The bd. of water comrs. has under consideration the installation of a filtration plant. Geo. R. Meeker, supt. bd. water comrs.

Crystal Springs, Miss.—This city will issue $7,000 bonds for constructing a tower and tank in connection with the water and light system.

Texarkana, Tex.—Will vote Dec. 14 on the question of issuing $200,000 bonds to construct a municipal water works system on the Texas side of this city.

Wellington, Tex.—Contracts will be let about Jan. 1 for constructing water works for the Wellington Water, Light & Ice Co. W. N. Benson, secy.

Murray, Utah—A resolution has been adopted providing for an appropriation to be used for driving wells, testing and determining the question of procuring a water supply.

Marquette, Mich.—Eestimates of the cost of the proposed extension of the intake 3,000-ft. into the lake will be made by the Duluth Engineering Co., of Duluth, Minn.

Colusa, Cal.—The bids received for constructing a water works system have been rejected as excessive, and the plans will be revised and new bids asked. J. W. Kaerth, cy. engr.

Blackwell, Okla.—The city engineer has reported favorably on the damming of the Chikaski river and the construction of an immense reservoir for the proposed water works system.

Colby, Kas.—The Commercial Club will ask the mayor and city council to call a special election to vote on the question of issuing bonds for the construction of a water works system.

Lamar, Mo.—(Special)—C. T. Wilson, cy. atty., advises us that this city's franchise will expire in April, 1910, and bids will be considered. An error in the November issue gave this item at Lamar, Colo.

Apache, Okla.—Will vote on the issue of $54,000 bonds for constructing a municipal water works system, sewers and electric lights.

Granite, Okla.—(Special)—J. W. Ryder advises us that he desires catalogues and other matter relative to turbine water wheels. He also desires details regarding installation, cost, power development, amount of water required, etc., from manufacturers.

Minneapolis, Minn.—Surveys for the proposed pipe line from Mille Lacs to this city will be made by the engineering department of the University of Minnesota for the purpose of obtaining data for Rudolph Hering, cons. engr., of New York City, to base estimates on of the cost of bringing water from the lake.

### CONTRACTS TO BE LET.

Okeene, Okla.—Bids are asked until Dec. 6 for constructing a water works system. O. G. Graalman, town clk.

Carroll, Neb.—Bids are asked until Jan. 11 for constructing a water works system (former bids rejected). Cy. clk.

Hull, Que.—Bids are asked until Dec. 6 for furnishing and erecting pumps and turbine wheels. John F. Boult, cy. clk.

Newburgh, N. Y.—Bids are asked until Dec. 6 for building a new gate house and boiler house. Curtis Stanton, supt. w. w.

Manila, P. I.—Bids are asked until Dec. 29 for installing a distribution system of Manila gravity water supply. Municipal bd.

Foley, Minn.—Bids are asked until Jan. 1 (readvertisement) for constructing a water works system. Frank J. Kotsmith, vil. recdr.

Kansas City, Kas.—Bids are asked until Dec. 13 for constructing a pumping engine at the pumping station at Quindaro. Bd. w. w. trustees.

East Orange, N. J.—Sealed bids are asked until Dec. 7 for furnishing 310-tons of c. i. pipe and 50-tons of specials. A. A. Reimer, clk.

Gulfport, Miss.—Bids are asked until Dec. 7 for constructing 14,580-ft. of 8-in., 27,700-ft. 6-in. and 2,000-ft. of 4-in. pipe. M. F. Sullivan, cy. engr.

Ft. Logan, Idaho—Bids are asked until Dec. 14 for building a pump house and furnishing an air compressor, steam pumps and piping. Capt. Chase Doster, constr. Q. M.

Belden, Neb.—Bids are asked until Dec. 15 for constructing a standpipe and foundation, installing pipe, valves, hydrants, etc., open well and triplex deep well pump, etc. F. B. Barber, vil. clk.

New York City—Bids are asked until Dec. 3 and 8 for constructing water mains in various streets, avenues and roads in Brooklyn, Queens and Manhattan boroughs. John H. O'Brien, prest. bd. water sup., etc.

Gulfport, Miss.—Bids are asked until Dec. 7 for furnishing pumping machinery, consisting of 2 turbine centrifugal pumps and motor, and 1 constant duty single suction Volute pump. N. D. Goodwin, cy. clk.

Brooklyn, N. Y.—Bids are asked until Dec. 8 for constructing a pump well, screen and grit chambers, and appurtenances at the Coney Island disposal works at Neptune ave. and W. 12th st. Bird S. Coler, prest. boro.

New York City.—Bids are asked until Dec. 8 for constructing Hill View reservoir and appurtenances, and portions of the Yonkers and Van Cortlandt siphons of the Catskill aqueduct. John A. Bensel, prest. bd. water sup., etc.

Dallas, Tex.—Bids are asked until Dec. 8 for furnishing 5,000-tons of piping and specials for constructing main line from White Rock reservoir and branch lines necessary to distribute water from the new reservoir. J. B. Winslett, cy. secy.

Indianola, Miss.—Bids are asked until Dec. 2 for furnishing a gasoline pump and engine, with necessary fittings, tank and appurtenances, 1,500-ft. 8-in. c. i. pipe, 1 8 and 1 6-in. check valve, 1 8-in. and 1 6-in. hydraulic valve. W. M. Kembraugh, town clk.

### CONTRACTS AWARDED.

Russellville, Ark.—The contract for constructing a concrete reservoir at the dam site was awarded to Peter Hugler.

Bay City, Mich.—The contract for constructing a water works and sewer system in the park was awarded to the Bay City Plumbing Co.

Rock Island, Ill.—The contract for installing a mechanical filtration plant in Reservoir Park was awarded to the Pottsburg Filter Mfg. Co., for $61,850.

Milwaukee, Wis.—The Allis-Chalmers Co., of this city, was awarded the contract for furnishing and installing a pumping engine at North Point station, for $64,800.

Kansas City, Kas.—The contract for furnishing 1,300-tons of 30-in. water pipe was awarded, Nov. 13, to the Dimmick Pipe Co., of Birmingham, Ala., for $36,000.

Rapid City, S. D.—The contract for constructing a gravity system of water works was awarded to the Katz-Craig Construction Co., of Omaha, Neb., for $18,355.

Hingham, Mass.—The contract for constructing a fresh water system at the naval magazine was awarded to the McCray Engineering Co., of Baltimore, Md., for $7,137.

Toronto, Ont.—The Canadian Westinghouse Co. was awarded the contract for electric motors for electric pumps to be installed at the main pumping station, for $107,765.

Greeley, Colo.—The contract for building a 2-mile tunnel through the Medicine Bow range was awarded to J. A. McIlwee, of Cripple Creek, Colo., for about $800,000.

Independence, Mo.—The contract for constructing a water works system, purification plant and tower at the county farm was awarded to the Freeborn Engineering Co., for $24,500.

Washington, La.—The contract for the extension of the water works system, requiring 5,000-ft. of 6-in. and 8,200-ft. of c. i. water mains, with hydrants and fittings, was awarded to A. C. Jones, of Opelousas, La.

Haledon (Paterson P. O.), N. J.—The contract for constructing a slow sand filter plant, a filtered water reservoir, and laying water mains, was awarded to the Hudson Terminal Construction Co., of New York, for $5,133.

## BRIDGES.

Mt. Pleasant, Ia.—The construction of a bridge over Skunk river is contemplated.

Leavenworth, Kas.—Bids are asked until Dec. 6 for constructing 3 steel bridges. J. W. Niehaus, co. clk.

Pueblo, Colo.—Plans are being prepared for constructing a bridge over Arkansas river at Union ave.

Rochester, Ind.—Bids are asked until Dec. 7 for the repair of a steel bridge. G. W. Dubois, co. audt.

Rensselaer, Ind.—Bids are asked until Dec. 6 for constructing a steel bridge. Jas. M. Leatherman, co. audt.

Plattsmouth, Neb.—Bids are asked until Dec. 6 for constructing wood and steel bridges. W. E. Rosencrans, co. clk.

Cincinnati, O.—Bids are asked until Dec. 6 for constructing a lift bridge over M. & E. Canal. J. J. Wanner, clk. B. P. S.

Vincennes, Ind.—Bids are asked until Dec. 7 for constructing concrete abutments for 2 bridges. John T. Scott, co. audt.

Merced, Cal.—Bids are asked until Jan. 4 for constructing a steel bridge across Merced river. P. J. Thornton, clk. bd. supvrs.

Rome, N. Y.—Bids are asked until Dec. 6 for constructing a steel highway bridge over Mohawk river. J. L. Plunkett, cy. engr.

Rock Island, Ill.—The question of constructing a bridge between this city and Henry county, across Rock river, is being renewed.

Arthabaska, Que.—Bids are asked until Dec. 9 for constructing a steel bridge over Becancour river. Louis Lavergne, secy.-treas.

Eureka, Ill.—Bids are asked until Dec. 2 for constructing a bridge over Mackinaw river, near Kappa. Joint bridge com. of co. bd. of supvrs.

Huntsville, O.—Bids are asked until Feb. 10 for constructing a steel bridge with concrete floor and abutments. C. M. Ritchie, co. engr.

Cameron, Man.—Bids are asked until Dec. 6 for constructing a pile bridge across Souris river, near Lauder. T. B. Woodhull, cy. secy. and treas.

Baltimore, Md.—Bids will be received after Jan. 1 for constructing a steel bridge over Gwynn's Falls at Franklin road. B. T. Fendall, cy. engr.

Avon, N. Y.—This town voted to issue $12,000 bonds for building a bridge over the Genesee river, on the old main state road leading from this town to Caledonia.

Phœnix, Ariz.—Bids are asked until Dec. 8 for constructing a highway bridge over the Gila river, near the town of Florence. J. J. Riggs, secy. bd. control.

Pittsburg, Pa.—Bids are asked until

Dec. 6 for removing the old bridge across the Monongahela river at Monongahela City, Pa. Co. comrs. Allegheny and Washington counties.

Salinas, Cal.—Bids are asked until Dec. 7 for building a highway bridge on reinforced concrete piles across the small slough on the north side of Paul's Island. T. P. Joy, clk.

Ocean City, N. J.—Plans and specifications have been authorized for a bridge across Great Egg Harbor Bay, from Somers' Point to Beasley's Point. The plans will be ready in December.

## STREET LIGHTING.

Ash Grove, Mo.—An electric light plant is contemplated.

Dundee, N. Y.—The village trustees have decided to increase the lighting system.

Erie, Kas.—This city voted to issue $50,000 bonds for constructing a combined electric light and water works system.

Center Moriches, N. Y.—The citizens have petitioned the town board for permission to form a street lighting district.

Jersey City, N. J.—The Great Falls Power Co. has been incorporated by W. C. Parker, L. J. Relyea and F. E. Griswold.

New Albany, Ind.—Bids are asked until Dec. 14 for lighting streets and alleys and public places for 10-yrs. John C. Short, cy. clk.

South Orange, N. J.—The village board is considering the advisability of municipal ownership of the street lighting plant.

Columbus, O.—Bids are asked until Dec. 10 for power equipment for the plant at the State Penitentiary. Osborn Engrg. Co., cons. engr., Cleveland.

Florida, N. Y.—The Public Service Com'n has authorized the Orange & Rockland Electric Co. to construct and operate an electric light system here.

Martinez, Cal.—Bids are asked until Dec. 6 for a 50-yr. franchise to erect poles and wires over the roads and highways in Contra Costa county. J. H. Wells, clk. bd. supvrs.

Lincoln, Neb.—The investigating committee appointed by the city council has recommended the installation of additional machinery to increase the capacity of the municipal electric plant.

Waverly, Kas.—The municipal electric light plant will be improved, including the installation of complete new power equipment, consisting of engine, generator, boiler, pump feed water heater, exciter, etc.

Meriden, Conn.—Plans are being considered for the organization of a company to operate a small electric light plant to furnish electricity to the merchants in the Cahill block. E. F. Donahue and M. W. Booth Co. are interested.

Binghamton, N. Y.—The bd. of mgrs. of the Binghamton State Hospital and the State commission in lunacy at the State Hospital recommended, Nov. 10, that the state legislature be petitioned for an appropriation of $55,000 for a new lighting plant.

Lamar, Mo.—(Special)—C. T. Wilson, cy. atty., advises us that the city electric light franchise will expire in January, 1910, and bids will be considered. An error in the November issue of MUNICIPAL ENGINEERING gave this as Lamar, Colo.

New York City—Preparations are being made for improving the lighting system in the parks, including the installation of about 1,500 tungsten lamps of 60 c. p. to replace about 400 gasoline lamps now in service. New lamps will be provided, also, for Prospect Park, Brooklyn boro.

## GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Portland, Ore.—Bids are asked until Dec. 20 for a new garbage crematory. Cy. audt.

Ellwood City, Pa.—The construction of a garbage disposal plant is contemplated, according to press reports.

Aurora, Ill.—The construction of a garbage disposal plant is contemplated, according to press reports. Fred Fauth, mayor.

Fountain Hill, Pa.—Bids are asked until Dec. 6 for the removal of ashes and garbage four yrs. J. A. Titlow, secy. boro coun.

Jersey City, N. J.—The contract for the removal of garbage and ashes for the fiscal year was awarded to Henry Byrne, for $48,200.

Pittsburg, Pa.—E. R. Walters, health director, has recommended 3 separate incinerating plants for the disposal of garbage, to be built by the city, instead of one central plant.

Washington, D. C.—The street cleaning department has purchased a combination sprinkler and cleaning machine of the Kindling Machinery Co. of Milwaukee, Wis. The machine sprinkles and sweeps at the same time.

Lynchburg, Va.—(Special)—This city contemplates the construction of a garbage crematory for the destruction of its garbage. The city authorities desire to correspond with companies making a specialty of constructing plants of this character. Address communcations to H. L. Shaner, cy. engr.

## PARKS.

Louisville, Ky.—The entire park system of this city is to be overhauled and important changes made.

Duluth, Minn.—The city council has voted to levy $10,000 to purchase lands to create Nemadji Park on the Nemadji river.

Seattle, Wash.—The preservation of the grounds of the late exposition here as a public park is strongly advocated.

Winnipeg, Man.—A by-law has been passed authorizing the city council to issue $150,000 bonds for the purchase of land for park sites.

Memphis, Tenn.—(Special)—Landscape architects will find a good opening here for work on private grounds. Both designers and men competent to take charge of the work on private grounds and carry out the designs will find an opportunity by addressing H. W. Brennan, editor of Civic Affairs, for more particulars.

## FIRE APPARATUS.

Gulfport, Miss.—Bids are asked until Dec. 7 for a fire alarm system. M. F. Sullivan, cy. engr.

Quincy, Ill.—A Gamewell fire alarm system has been recommended for this city. Mayor Steinbach.

Imperial, Cal.—(Special)—J. T. Rice, cy. engr., says this city wishes to install a few fire alarms, and desires to be put in touch with some simple and cheap device or system. The town will have a siren whistle at the water works plant.

Seattle, Wash.—An ordinance has been passed appropriating $11,300 for the purchase of one automobile attachment for the aerial hook and ladder truck, and one combination chemical and hose wagon. Bids are asked until Dec. 7 for furnishing fire hose. B. P. W.

# Bitulithic Pavement is Street Insurance

It insures against dust and mud

It insures against slipperiness

It insures against traffic noises

It insures against cracks and disintegration

It insures against wavy surface

It insures against absorption of street filth

It insures against costly repairs

It insures against horses falling

It assures a sanitary street

It assures a durable street

It assures conscientious workmanship

It assures the best materials

It assures perfect satisfaction

## Bitulithic Insurance is Safest and Surest

*Our literature explains; yours for the asking*

# Warren Brothers Company

BOSTON, MASSACHUSETTS

REGISTERED TRADE-MARKS

"Bitulithic" "Puritan" "Bitustone" "Bituminous Macadam" "Bitrock"

# WHAT OTHERS SAY ABOUT US

Nothing is so dependent upon public approval as a publication.

It *must* meet the demands of the class for which it is published, and, in order to stand in a position of absolute authority, it must have the perfect confidence of all its subscribers.

The thousands of similar letters we have received testify to us the value *Municipal Engineering* is to those in its field.

We can not quote all the letters of commendation that come to us, but below are a few that give just an inkling of the high appreciation of *Municipal Engineering* by its great number of readers in varied lines of work in different parts of the world.

## A Household Word

Municipal Engineering Co., Indianapolis:

GENTLEMEN—Enclosed find $2.00 to renew subscription. I suppose I could get along without your magazine, but I would hate to try it now. It has got to be a "household word" with us. The current number alone is worth five times the year's subscription. Back numbers, carefully preserved, are invaluable as a reference library.

J. A. WILSON, City Engineer.
Lexington, Mo.

## The Best

Municipal Engineering Co., Indianapolis:

DEAR SIRS—Please find check enclosed to pay for *Municipal Engineering* for another year. Yours is the best paper of the kind reaching my desk.

GEORGE A. FLETCHER (Cy. C. E.)
Brazil, Ind.

## Most Instructive and Intelligent

Municipal Engineering Co.,
Indianapolis, Ind.:

GENTLEMEN—I think your magazine one of the most instructive, also the most intelligent magazine on the market to-day.

M. J. CHARLEY, Contractor.
La Salle, Ill.

## From the Phillipines

Municipal Engineering Co.,
Indianapolis, Ind.:

GENTLEMEN—The magazine is an especially valuable one in my position because the District Engineers in these islands have supervision and charge of all municipal and provincial improvements. Thanking you again, I beg to remain, sincerely,

MORGAN CILLEY, Assistant Engineer.
Manila, Philippine Islands.

## Reads Every Word in Every Issue and Advertising

Municipal Engineering Co., Indianapolis:

GENTLEMEN—Please accept my thanks for your careful answer to my letter of March 11. My late father-in-law had taken your paper for a good many years. While I had nothing to do with municipal engineering, your paper was so interesting and educative that I have read practically every word in every issue, including the advertising. Whoever is responsible for the position *Municipal Engineering* occupies, has taken a broad-gauge position. It must take a vast amount of work and a great deal of patience. I know that the management must have the satisfaction of knowing that their work is well done. I congratulate you upon your results, and I hope that your financial returns are as satisfactory as your paper must be to all its readers. Thanking you for your efforts and pains in answering my letter of inquiry, I am,

G. W. PRIEST, President Water Works.
Mansfield, Mass.

YOU CANNOT THINK OF ANYTHING GOOD THAT HAS NOT BEEN SAID ABOUT MUNICIPAL ENGINEERING

**MUNICIPAL ENGINEERING CO., Indianapolis**

# ALPHABETICAL INDEX TO ADVERTISERS.


Alma Cement Co. 62
Alpha Portland Cement Co. 60
Alsen's Am. Portland Cement Co. 50
American Asphaltum and Rubber Co. 27
American Cement Co. 60
American Rolling Mill Co. 31
Aquabar Co., The 61
Ashland Steel Range & Mfg. Co. 37
Ashley House Sewage Disposal Co. 46
Association de la Presse Technique 48
Association of Engineering Societies 44
Atlas Dryer Co. 26
Atlas Portland Cement Co. 59
Austin-Western Co. 38, 40

Bannon (P.) Sewer Pipe Co. 22
Barker, Harry T. 16
Barrett Mfg. Co. 18, 20
Bausch-Lomb Optical Co. 52
Black Manufacturing Co. 36
Blair, W. P. 46
Blome, Rudolph S. 2, 62
Boone Brick, Tile and Paving Co. 42
Brain, C. C. 44
Brown, C. C. 17
Brown, Mason L. 16
Buckeye Brick and Block Co. 45
Buckeye Fire Clay Co. 22
Buffalo Meter Co. 34
Buffalo Steam Roller Co. 41
Burness, F. B. 55

Canton Culvert Co. 48
Carlson & Theselius, 45
Carlyle Paving Brick Co. 46
Case Threshing Machine Co., J. I. 39
Central Paving Co. 49
Chicago Portland Cement Co. 56
City Wastes Disposal Co. 16
Clark, George W. 49
Clark, H. W. 34
Clearfield Clay Working Co. 45
Cleveland Stone Co. 48
Clinton Paving and Building Brick Co. 44
Colby, B. H. 16
Concrete Steel Engineering Co. 49
Conley & Co., J. E. 49
Connelly, P. F. 23
Contractors' Tool Co. 23
Cottingham, Chas. 17
Cresson, Geo. V. Co. 26
Cummer (F. D.) & Son Co. 26

Danville Brick Co. 45
Deckman-Duty Co. 42
Dee Co., W. E. 28
Dexter Portland Cement. 62
Dow & Smith 17
Dunn, Frank B. 47
Duplex Foundry & Mfg. Co. 56

East Iron & Machine Co. 31
Enterprise Manufacturing Co. 41
Erie Machine Shops 40
Erler, Wm. J. 49
Etnyre & Co., E. D. 41

Fife, Geo. W. 49
Finan, John 17
Ford Meter Box Co. 34
French & Co., Samuel H. 62

Gabriel & Schall 27
Gamewell Fire Alarm Telegraph Co. 33
Gas Power Co. 62
General Asphalt Products Supply Agency 26
General Fire-proofing Co. 52
Gilsonite Construction Co. 49
Globe Asphalt Co. 28
Grand Rapids Meter Box Co. 34
Granite City Lime and Cement Co. 49
Grumiaux Subscription Agency 8
Gurley, W. & L. E. 17

Harris Air Pump Co. 33
Hazlehurst & Anderson 16
Hering & Fuller 17
Hill, W. H., Construction Co. 49
Holmes, A. L. 26
Holmes, F. B. & Co. 46
Holzbog & Bro., Geo. H. 35
Hoosier Construction Co. 29
Howard, J. W. 16
Hunt (R. W.) Co. 17

Impervious Product Co. 27
Indiana Paving Brick and Block Co. 45
Indian Refining Co. 28
Iroquois Iron Works 41

Jeffrey Mfg. Co. 26

Kalamazoo Foundry & Mach. Co. 26
Kelly Springfield Road Roller Co. 41
Kentucky Vitrified Brick Co. 45
Kettle River Quarries Co. 49
Kindling Machinery Co. 39

Lehigh Portland Cement Co. 57
Lehigh Valley Testing Laboratory 17
Lewis Manufacturing Co., F. J. 21
Lock Joint Pipe Co. 32
Lucius, F. J. 17
Lufkin Rule Co. 60

Marks, Wm. D. 16
Marquette Cement Mfg. Co. 62
Maury, Dabney H. 16
McNutt, Lewis 22
McWane Pipe Works 33
Meacham & Wright 58
Metropolitan Paving Brick Co., The 42
Michigan Paving Brick Co. 45
Moses, Frank D. 17
Moulding, Thos. Co. 46

National Bitumen Co. 24
National Paving Brick Mf'rs Association 46

Ohio Quarries Co. 42
Olsen, Tinius & Co. 56

Pacific Builder and Engineer 8
Pacific Flush Tank Co. 22
Parlin & Orendorff Co. 50
Peebles Paving Brick Co. 46
Peninsular Portland Cement Co. 56
People's Coal and Cement Co. 49
Perfect Sewer Trap Mfg. Co. 22
Potter, Alexander. 17
Potter Mfg. Co. 28
Power Specialty Co. 17
Purington Paving Brick Co. 43

Red Wing Filter Sand Co. 27
Ruggles-Coles Engineering Co. 26
Russell, S. Bent 16

Saginaw Paving Brick Co. 45
Salfisberg (J. E.) & Co. 48
Sandusky Portland Cement Co. 61
Sanitary Sewer Construction Co. 48
Schaeffer & Gengnagel 48
Shunk Plow Co. 27
Sicilian Asphalt Paving Co. 27
Simplex Valve and Meter Co. 34
Spackman (Henry S.) Engineering Co. 16
Sparks, John C. 17
Springfield Paving Brick Co. 44
St. Louis Crushed Quartz Co. 49
St. Louis Portland Cement Co. 62
Standard Asphalt & Rubber Co. 25
Standard Oil Co. 19
Steel Protected Concrete Co. 35

# ALPHABETICAL INDEX TO ADVERTISERS.

*CONTINUED.*


Stevens, H., Sons' Co..... 22
Stortz & Son, John..... 23
Streicher, H. F. & Co..... 49
Studebaker Bros.' Mfg. Co..... 37
Sun Co..... 49
Supe ior Cement Co..... 61
Superior Iron Works..... 33

Terre Haute Brick and Pipe Co..... 45
Texas Co., The ..... 28
Tinker, Clifford A..... 16
Troy Wagon Works..... 22, 35
Turner, F. M..... 17
Tyrrell, H. G..... 16

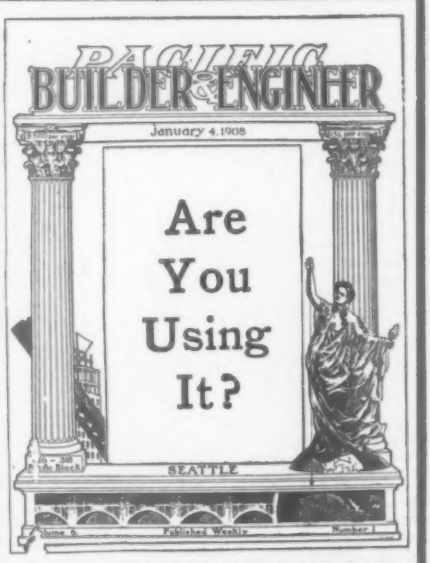
United Kansas Portland Cement Co..... 56
U. S. Wood Preserving Co..... 9
Universal Portland Cement Co..... 58
Utica Hydraulic Cement Co..... 50
Uvalde Asphalt Co..... 37

Von Hartzfelt, Carl..... 16

Wabash Clay Co..... 42
Warner Co., Charles..... 61
Warren Asphalt Paving Co..... 6
Warren Bros. Co..... 3, 53
Wassal Brick Co., The..... 42
Waterloo Cement Machinery Corporation..... 55
Watson, Wilbur J..... 16
Western Construction Co..... 49
Wisconsin Granite Co..... 29
Wyckoff Pipe & Creosoting Co..... 29

Zeiser Bros..... 60






If not, you are losing the best chance of your life of getting before the buyers of a section where business is rapidly reviving; buildings and new plants are being put up, and old equipments being overhauled and renewed.

44 pages every week of fresh Advance Information. $5.00 per year. Send for Sample Copy—FREE.

317 A, Pacific Block : SEATTLE, U. S. A.

# GRUMIAUX

## The Magazine Man

## LET ME TEACH YOU

The Magazine Subscription Game

## A Business with a Big Future

### How I Developed My Business from $47 to $400,000 a Year

The subscription agency business is just beginning to develop, and every man and woman can learn it by my complete instructions, personally conducted by mail. You can in your leisure hours conduct a mail-order business that is dignified and earn **large profits,** by the **Grumiaux system.**

Begin in a small way and watch it grow. The principles upon which I built my business become yours and the benefits of my 22 years' experience—you need not make the mistakes I did—the elements of success as I discovered them, my ideas, my schemes, all become yours through the **Grumiaux system.**

Year after year, the renewal business increases profits and before you know it, you have a substantial business of your own. Start by working a few hours evenings.

*Full particulars by mentioning this magazine*

**GRUMIAUX, The Magazine Man**

**Le Roy, New York**

TREMONT STREET, BOSTON. U. S. WOOD BLOCK PAVEMENT LAID IN 1900. NO SIGNS OF WEAR TO DATE.

# WHAT THE EXPERTS SAID ABOUT U. S. WOOD BLOCKS

WHEN it was recently proposed to pave Market Street, the central business street of Philadelphia, the Eastern Market Street Business Men's Association, asked Dow & Smith, Consulting, Inspecting and Testing Experts on Pavements, to report on the desirability of U. S. Wood Blocks. The following is a typical excerpt from the report which they made:

"Tremont Street, Boston, which carries a heavy traffic, was divided in half longitudinally, one side being laid with sheet asphalt, the other with creosoted pine blocks (*U. S. Wood Blocks*), both halves of the street being thus subjected to the same traffic. That was in 1900. The asphalt side has had extensive repairs and is at present in bad condition, numerous holes having developed.

"A straight edge laid upon the Wood Blocks where they adjoin the asphalt shows that the wear on the blocks has been practically nil. The condition of the blocks themselves confirms this, as even where the pavement is practically grooved by separating the blocks, the tops of the blocks show no brooming whatever.

"To all appearances these blocks, although subjected to severe traffic for the past nine years, are *practically as good as the day they were put down*. There has been no maintenance cost whatever."

*Booklets showing cuts of U. S. Block Pavements in various cities sent free on request.*

U. S. WOOD PRESERVING COMPANY
165 BROADWAY, NEW YORK

# BUSINESS DIRECTORY.

**Air Pumps.**
Harris Air Pump Co., Indianapolis, Ind.

**Ambulances.**
Geo. H. Holzbog & Bro., Jeffersonville, Ind.

**Analyses.**
Henry S. Spackman Engineering Co., Philadelphia.

**Architects.**
Clifford A. Tinker, Westfield, Mass.

**Artificial Stone Sidewalks.**
R. S. Blome Co., Chicago, Ill.
Warren Brothers Company, Boston, Mass.
Warren Construction Co., Portland, Ore.

**Asphalt.**
American Asphaltum and Rubber Co., Chicago, Ill.
H. & A. B. Aveline Sicilian Rock Asphalt Co., Catania, Italy (postage 5 cents.)
Gabriel & Schall, New York City.
General Asphalt Products Supply Agency, New York City.
Globe Asphalt Co., Pittsburg, Pa.
Impervious Product Co., Baltimore, Md.
Indian Refining Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.
The Sicilian Asphalt Paving Co., New York.
Standard Asphalt & Rubber Co., Chicago, Ill.
Standard Oil Co., New York City.
The Texas Co., New York City.
Uvalde Asphalt Co., New York City.
Warren Asphalt Paving Co., Cambridge, Mass.

**Asphalt Filler.**
American Asphaltum & Rubber Co., Chicago, Ill.
General Asphalt Products Supply Agency, New York City.
Impervious Product Co., Baltimore, Md.
Indian Refining Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.
Standard Oil Co., New York City.

**Asphalt (Brunswick) Importers.**
Gabriel & Schall, New York City.

**Asphalt Floors.**
American Asphaltum & Rubber Co., Chicago, Ill.
R. S. Blome Co., Chicago, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Asphalt Machinery.**
Atlas Dryer Co., Cleveland, O.
F. D. Cummer & Son Co., Cleveland, O.
East Iron & Machine Co., Lima, O.
Iroquois Iron Works, Buffalo, N. Y.
Warren Asphalt Paving Co., Cambridge, Mass.

**Asphalt Pavements.**
American Asphaltum & Rubber Co., Chicago, Ill.
Gilsonite Construction Co., St. Louis, Mo.
Indian Refining Co., New York City.
The Sicilian Asphalt Co., New York.
Standard Asphalt & Rubber Co., Chicago, Ill.
The Texas Co., New York City.
Warren Asphalt Paving Co., Cambridge, Mass.
Western Construction Co., Lafayette, Ind.

**Asphalt Pavement and Filler.**
American Asphaltum & Rubber Co., Chicago, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Asphalt Plants.**
Atlas Dryer Co., Cleveland, O.
The F. D. Cummer & Son Co., Cleveland, O.
East Iron & Machine Co., Lima, O.
Erie Machine Shop, Erie, Pa.
Iroquois Iron Works, Buffalo, N. Y.
Warren Asphalt Paving Co., Cambridge, Mass.

**Asphalt Railroad Plants.**
Atlas Dryer Co., Cleveland, O.
F. D. Cummer & Son Co., Cleveland, O.
East Iron & Machine Co., Lima, O.
Iroquois Iron Works, Buffalo, N. Y.
Warren Asphalt Cement Co., Cambridge, Mass.

**Asphalt Sidewalks.**
R. S. Blome Co., Chicago, Ill.
Sicilian Asphalt Paving Co., New York City.
Warren Bros. Co., Boston, Mass.

**Asphalt Tools.**
Contractors' Tool Company, Philadelphia, Pa.
Iroquois Iron Works, Buffalo, N. Y.
John Stortz & Son, Philadelphia, Pa.
Warren Asphalt Paving Co., Cambridge, Mass.

**Automatic Brick Conveyor.**
Carlson & Theselius, Chicago, Ill.

**Bituminous Macadam Materials.**
F. J. Lewis Mfg. Co., Moline, Ill.

**Bitulithic Materials.**
F. J. Lewis Mfg. Co., Moline, Ill.

**Bitulithic Pavements.**
Hoosier Construction Co., Indianapolis, Ind.
Warren Bros. Co., Boston, Mass.

**Bituminous Macadam.**
Warren Bros. Co., Boston, Mass.

**Bolting Screens.**
Jeffrey Mfg. Co., Columbus, O.

**Books on Concrete Bridges.**
H. G. Tyrell, Evanston, Ill.

**Brick Dryers.**
Atlas Dryer Co., Cleveland, O.

**Brick Clamps.**
Duplex Foundry and Mfg. Co., Cleveland, O.

**Brick Conveyor, Automatic.**
Carlson & Theselius, Chicago, Ill.

**Brick Testing Machinery.**
Tinius Olsen & Co., Philadelphia, Pa.

**Bridge Coatings.**
American Asphaltum and Rubber Co., Chicago, Ill.
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Bridges.**
R. S. Blome Co., Chicago, Ill.
Concrete Steel Engineering Co., New York City.
Geo. W. Fife, Indianapolis, Ind.

**Builders' Supplies.**
Ohio Quarries Co., Cleveland, O.

**Calculation Tables.**
C. C. Brain, Brain, New York City.

**Cast Iron Pipe.**
R. C. McWane, New York City.

**Catch Basin Manufacturers.**
Duplex Foundry & Mfg. Co., Cleveland, O.

**Cement.**
Alma Cement Co., Wellston, O.
Alpha Portland Cement Co., Alpha, N. J.
Aisen's Am. Portland Cement Co., New York City.
American Cement Co., Philadelphia, Pa.
Atlas Portland Cement Co., New York City.
Barrett Mfg. Co., New York City.
Chicago Portland Cement Co., Chicago, Ill.
Dexter Portland Cement Co., Philadelphia, Pa.
French, Samuel H. & Co., Philadelphia, Pa.
Granite City Lime & Cement Co., Granite City, Ill.
F. B. Holmes & Co., Detroit, Mich.
H. H. Lamb, Indianapolis, Ind.
Lehigh Portland Cement Co., Cleveland, O.
Lesley & Trinkle, Philadelphia, Pa.
Marquette Cement Mfg. Co., Chicago, Ill.
Meacham & Wright, Chicago, Ill.
Thomas Moulding Co., Chicago, Ill.
Peninsular Portland Cement Co., Jackson, Mich.
St. Louis Portland Cement Co., St. Louis, Mo.
Schaeffer & Gengnagel, Dayton, O.
Superior Portland Cement Co., Cincinnati, O.
United Kansas Portland Cement Co., Kansas City, Mo.
Universal Portland Cement Co., Chicago, Ill.
Utica Hydraulic Cement Co., Utica, Ill.
Charles Warner Co., Wilmington, Del.

**Cement Machinery.**
Atlas Dryer Co., Cleveland, O.
Geo. V. Cresson Co., Philadelphia, Pa.
F. D. Cummer & Son Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
Ruggles-Coles Engineering Co., New York City.

**Cement Paving.**
R. S. Blome Co., Chicago, Ill.
Gilsonite Construction Co., St. Louis, Mo.
J. E. Salfisberg & Co., Aurora, Ill.

**Cement Plant Designers.**
Henry S. Spackman Engineering Co., Philadelphia, Pa.

**Cement, Tar and Pitch.**
F. J. Lewis Mfg. Co., Moline, Ill.

**Cement Testing.**
Lehigh Valley Testing Laboratory, Allentown, Pa.

**Cement Testing Machinery.**
Tinius Olsen & Co., Philadelphia, Pa.

**Cement Tools.**
P. F. Connelly, El Reno, Okla.
Contractors' Tool Co., Philadelphia, Pa.
John Stortz & Son, Philadelphia, Pa.

# BUSINESS DIRECTORY—CONTINUED.

**Chemical Tests.**
R. W. Hunt & Co., Chicago, Ill.
Lehigh Valley Testing Laboratory, Allentown, Pa.
Henry S. Spackman Engineering Co., Philadelphia, Pa.
John C. Sparks, New York City.

**Chemists—Cement.**
Lehigh Valley Testing Laboratory, Allentown, Pa.
Henry S. Spackman Engineering Co., Philadelphia, Pa.

**Chemists—Consulting.**
Carl Von Hartzfelt, Wheeling W. Va.
Henry S. Spackman Engineering Co., Philadelphia, Pa.
John C. Sparks, New York City.

**Civil Engineers.**
C. C. Brown, Indianapolis, Ind.
Mason L. Brown, Detroit, Mich.
B. H. Colby, St. Louis, Mo.
Charles Cottingham, Danville, Ind.
John Finan, Hamilton, O.
Hering & Fuller, New York, N. Y.
J. W. Howard, New York City.
R. W. Hunt & Co., Chicago, Ill.
F. J. Lucius, Pittsburg, Pa.
Wm. D. Marks, New York City.
Dabney H. Maury, Peoria, Ill.
Frank D. Moses, Trenton, N. J.
Alexander Potter, New York City.
S. Bent Russell, St. Louis, Mo.
Henry S. Spackman Engineering Co., Philadelphia, Pa.
Clifford A. Tinker, Westfield, Mass.
F. M. Turner, Dayton, O.
H. G. Tyrrell, Evanston, Ill.
Wilbur J. Watson, Cleveland, O.

**Clay-Working Machinery.**
Atlas Dryer Co., Cleveland, O.

**Clay Products.**
Lewis McNutt, Brazil, Ind.

**Coal and Coke.**
Schaeffer & Gengnagle, Dayton, O.

**Coal Tar.**
Barrett Mfg. Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.
Warren Bros. Co., Boston, Mass.

**Combined Curb and Gutter.**
Rudolph S. Blome Co., Chicago, Ill.
Steel Protected Concrete Co., Philadelphia, Pa.
Warren Bros. Co., Boston, Mass.

**Concrete Bridges, Books On.**
H. G. Tyrell, Evanston, Ill.

**Concrete Construction Machinery.**
Ashland Steel Range & Mfg. Co., Ashland, O.
F. B. Burness, Kansas City, Mo.
Waterloo Cement Machinery Co., Waterloo, Ia.

**Concrete Construction, Reinforced.**
General Fireproofing Co., Youngstown, Ohio.
Lock Joint Pipe Co., New York City.

**Concrete Mixers.**
Ashland Steel Range & Mfg. Co., Ashland, O.
Jeffrey Mfg. Co., Columbus, O.
Waterloo Cement Machinery Co., Waterloo, Ia.

**Concrete Steel Arch Bridges.**
Concrete Steel Engineering Co., New York City.

**Concrete, Tar.**
Barrett Mfg. Co., New York City.

**Concrete Truck.**
F. B. Burness, Kansas City, Mo.

**Concrete Work.**
Rudolph S. Blome Co., Chicago, Ill.
Central Paving Co., Chicago, Ill.
P. F. Connelly, El Reno, Okla.
Wm. J. Erler, Terre Haute, Ind.
Geo. W. Fife, Indianapolis, Ind.
J. E. Salfisberg & Co., Aurora, Ill
Sanitary Sewer Construction Co., Jackson, Mich.
Clifford A. Tinker, Westfield, Mass.
Warren Bros. Co., Boston, Mass.

**Consulting Engineers.**
C. C. Brown, Indianapolis, Ind.
Dow & Smith, New York City.
John Finan, Hamilton, O.
Carl Von Hartzfelt, Wheeling W. Va.
J. W. Howard, New oYrk City.
F. J. Lucius, Pittsburg, Pa.
Alexander Potter, New York City.
S. Bent Russell, St. Louis, Mo.
Power Specialty Co., New York City.
John C. Sparks, New York City.
F. M. Turner, Dayton, O.
H. G. Tyrrell, Evanston, Ill.
Wilbur J. Watson, Cleveland, O.

**Contractors.**
Rudolph S. Blome Co., Chicago, Ill.
Carlson & Theselius, Chicago, Ill.
Central Paving Co., Chicago, Ill.
City Wastes Disposal Co., New York City.
J. E. Conley & Co., Dayton, O.
Wm. J. Erler, Terre Haute, Ind.
Geo. W. Fife, Indianapolis, Ind.
Gas Power Co., New York City.
Ollsonite Construction Co., St. Louis, Mo.
Hoosier Construction Co., Indianapolis, Ind.
Indiana Paving Brick & Block Co., Indianapolis, Ind.
J. E. Salfisberg & Co., Aurora, Ill.
Sanitary Sewer Construction Co., Jackson, Mich.
H. P. Streicher & Co., Toledo, O.

**Contractors' Supplies.**
Ohio Quarries Co., Cleveland, O.
Standard Asphalt & Rubber Co., Chicago, Ill.
St. Louis Crushed Quartz Co., St. Louis, Mo.
Schaeffer & Gengnagle, Dayton, O.

**Contractors' Tools and Machinery.**
Austin & Western Co., Ltd., Chicago, Ill.
P. F. Connelly, El Reno, Okla.
Contractors' Tool Company, Philadelphia, Pa.
John Stortz & Son, Philadelphia, Pa.
Shunk Plow Co., Bucyrus, O.
Zeiser Bros., Berwick, Pa.

**Contractors' Wagons.**
Austin-Western Co., Chicago, Ill.
Black Mfg. Co., Chicago, Ill.
Geo. H. Holzbog & Bro., Jeffersonville, Ind.
Studebaker Bros. Mfg. Co., South Bend, Ind.
Troy Wagon Works Co., Troy, O.

**Conveyors.**
The Jeffrey Mfg. Co., Columbus, O.

**Creosote.**
Barrett Mfg. Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.
Republic Chemical & Creosoting Co., Indianapolis, Ind.
U. S. Wood Preserving Co., New York City
Wyckoff Pipe & Creosoting Co., New York City.

**Creosoted Wood Block.**
Kettle River Quarries Co., Minneapolis, Minn.
Republic Chemical and Creosoting Co., Indianapolis, Ind.
U. S. Wood Preserving Co., New York City
Wyckoff Pipe & Creosoting Co., New York City.

**Crushers, Rock and Ore.**
Austin & Western Co., Ltd., Chicago, Ill.
Geo. V. Cresson Co., Philadelphia, Pa.
Jeffrey Mfg. Co., Columbus, O.

**Crushed Granite.**
Wisconsin Granite Co., Chicago, Ill.

**Crushed Stone.**
Cleveland Stone Co., Chicago, Ill.
Ohio Quarries Co., Cleveland, O.
St. Louis Crushed Quartz Co., St. Louis, Mo.
Wisconsin Granite Co., Chicago, Ill.

**Culvert Pipe.**
American Rolling Mill Co., Middletown, O.
Canton Culvert Co., Canton, O.
Lock Joint Pipe Co., New York City.
R. C. McWane, New York City.

**Culvert Pipe, Cast Iron.**
R. C. McWane, New York City.

**Culvert Pipe, Vitrified.**
W. E. Dee Clay Mfg. Co., Chicago, Ill.
Buckeye Fire Clay Co., Uhrichville, O.
Michigan Sewer Pipe Co., Jackson, Mich.
H. Stevens' Sons Co., Macon, Ga.
Terre Haute Brick & Pipe Co., Terre Haute, Ind.

**Culverts.**
American Rolling Mill Co., Middletown, O.
Canton Culvert Co., Canton, O.
R. C. McWane, New York City.

**Curbing.**
R. S. Blome Co., Chicago, Ill.
Cleveland Stone Company, Cleveland, O.
Ohio Quarries Co., Cleveland, O.
Steel Protected Concrete Co., Philadelphia, Pa.
Warren Bros. Co., Boston, Mass.

# BUSINESS DIRECTORY—CONTINUED.

**Damp Course.**
Barrett Mfg. Co., New York City.

**Damp-Proofing.**
Barrett Mfg. Co., New York City.

**Destructors.**
Power Specialty Co., New York City.

**Drain Tile.**
Boone Brick, Tile & Paving Co., Boone, Ia.
W. E. Dee Clay Mfg. Co., Chicago, Ill.
Michigan Paving Brick Co., Saginaw, Mich.

**Drinking Fountains.**
Superior Iron Works, Superior, Wis.

**Dryers.**
Atlas Dryer Co., Cleveland, O.
F. D. Cummer & Son Co., Cleveland, O.
Iroquois Iron Works, Buffalo, N. Y.
Ruggles-Coles Engineering Co., New York City.

**Dump Wagons.**
Austin-Western Co., Chicago, Ill.
Black Mfg. Co., Chicago, Ill.
Geo. H. Holzbog & Bro., Jeffersonville, Ind.
Studebaker Bros. Mfg. Co., South Bend, Ind.
Troy Wagon Works Co., Troy, O.

**Duplex Brick Clamp.**
Duplex Foundry and Mfg. Co., Cleveland, O.

**Dust Layers.**
Barrett Mfg. Co., New York City.

**Dust Laying Compound.**
Barrett Mfg. Co., New York City.
Impervious Product Co., Baltimore, Md.
Indian Refining Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Electrical Insulation.**
Standard Asphalt & Rubber Co., Chicago, Ill.

**Electrolytic Investigations.**
Dabney H. Maury, Peoria, Ill.

**Engineering Instruments.**
Bausch-Lomb Optical Co., Rochester, N. Y.
W. & L. E. Gurley Co., Troy, N. Y.
Lufkin Rule Co., Saginaw, Mich.

**Expansion Joints.**
American Asphaltum & Rubber Co., Chicago, Ill.
Barrett Mfg. Co., New York City.
A. L. Holmes, Grand Rapids, Mich.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Expanded Metal Construction.**
R. S. Blome Co., Chicago, Ill.

**Filler.**
American Asphaltum & Rubber Co., Chicago, Ill.
Barrett Manufacturing Co., New York City.
Impervious Product Co., Baltimore, Md.
Indian Refining Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.
Sun Co., Philadelphia, Pa.

**Filler Asphalt.**
American Asphaltum & Rubber Co., Chicago, Ill.
Indian Refining Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Filter Sand.**
Red Wing Filter Sand Co., Red Wing, Minn.

**Fire Alarm Telegraph.**
Gamewell Fire Alarm Telegraph Co., New York.

**Fire Brick.**
Clearfield Clay Working Co., Clearfield, Pa.
F. B. Holmes & Co., Detroit, Mich.
Michigan Paving Brick Co., Saginaw, Mich.
Thomas Moulding Co., Chicago, Ill.
H. Stevens' Sons Co., Macon, Ga.

**Fire Clay Products.**
Buckeye Fire Clay Co., Urichville, O.
Clearfield Clay Working Co., Clearfield, Pa.
W. E. Dee Clay Mfg. Co., Chicago, Ill.
F. B. Holmes & Co., Detroit, Mich.
Michigan Paving Brick Co., Saginaw, Mich.
Thomas Moulding Co., Chicago, Ill.
H. Stevens' Sons Co., Macon, Ga.

**Fire Proof Construction.**
R. S. Blome Co., Chicago, Ill.
General Fireproofing Co., Youngstown, Ohio.

**Floors.**
American Asphaltum & Rubber Co., Chicago, Ill.
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Flue Liners.**
W. E. Dee Clay Mfg. Co., Chicago, Ill.
Lewis McNutt, Brazil, Ind.

**Flush Tanks.**
Pacific Flush Tank Co., Chicago, Ill.

**Foundation, Concrete.**
R. S. Blome Co., Chicago, Ill.

**Foundations, Bituminous Concrete.**
Barrett Mfg. Co., New York City.

**Fountains.**
Superior Iron Works, Superior, Wis.

**Garbage Disposal Plants.**
City Wastes Disposal Co., New York City.
Power Specialty Co., New York City.

**Gas Engineers.**
Gas Power Co., New York City.
Carl Von Hartzfelt, Wheeling W. Va.
Frank D. Moses, Trenton, N. J.
Wm. D. Marks, New York City.

**Gas Pipe.**
McWane Pipe Works, New York City.

**Gas Producers.**
Gas Power Co., New York City.

**Gas Works.**
Gas Power Co., New York City.
Frank D. Moses, Trenton, N. J.

**Granite, Crushed.**
Wisconsin Granite Co., Chicago, Ill.

**Granitoid Concrete Block Pavement.**
Rudolph S. Blome Co., Chicago, Ill.

**Gum Paints and Varnish.**
Standard Asphalt & Rubber Co., Chicago, Ill.

**Hoisters.**
Potter Mfg. Co., Indianapolis, Ind.

**Hoisting Machinery.**
Jeffrey Mfg. Co., Columbus, O.

**Hollow Building Blocks.**
Lewis McNutt, Brazil, Ind.

**Hydraulic Cement.**
Meacham & Wright, Chicago, Ill.
Utica Hydraulic Cement Co., Utica, Ill.

**Hydrolene.**
Sun Co., Philadelphia, Pa.

**Impregnating Gums.**
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Incinerators.**
Power Specialty Co., New York City.

**Inspection of Buildings.**
Lehigh Valley Testing Laboratory, Allentown, Pa.

**Inspection of Structural Materials.**
Lehigh Valley Testing Laboratory, Allentown, Pa.

**Insulating Gums and Compounds.**
Standard Asphalt & Rubber Co., Chicago, Ill.

**Insulating Material.**
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Iron Paints.**
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Laboratory.**
Lehigh Valley Testing Laboratory, Allentown, Pa.
Henry S. Spackman Engineering Co., Philadelphia, Pa.

**Landscape Engineers.**
Mason L. Brown, Detroit, Mich.

**Macadamizing.**
Granite City Lime & Cement Co., Granite City, Ill.
Warren Bros. Co., Boston, Mass.

**Mastic.**
American Asphaltum & Rubber Co., Chicago, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Mastic Floors.**
American Asphaltum & Rubber Co., Chicago, Ill.
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Mechanical Engineers.**
Dabney H. Maury, Peoria, Ill.

# BUSINESS DIRECTORY—CONTINUED.

**Meters.**
Buffalo Meter Co., Buffalo, N. Y.
Simplex Valve and Meter Co., Philadelphia, Pa.

**Meter Boxes.**
H. W. Clark, Mattoon, Ill.
Ford Meter Box Co., Hartford City, Ind.
Grand Rapids Meter Box Co., Grand Rapids, Mich.

**Mineral Rubber.**
American Asphaltum and Rubber Co., Chicago, Ill.
F. J. Lewis Mfg. Co., Moline, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Mineral Rubber Pipe Dip & Coatings.**
American Asphaltum & Rubber Co., Chicago, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Non-Staining Cement.**
Meacham & Wright, Chicago, Ill.

**Paint and Varnish Gums.**
Standard Asphalt & Rubber Co., Chicago, Ill.

**Paints.**
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Paints, Iron.**
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Pavement Expert.**
J. W. Howard, New York City.

**Pavements.**
American Asphaltum & Rubber Co., Chicago, Ill.
Rudolph S. Blome Co., Chicago, Ill.
Indian Refining Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.
Standard Oil Co., New York City.
Wisconsin Granite Co., Chicago, Ill.
Wyckoff Pipe & Creosoting Co., New York City.

**Paving Blocks.**
R. S. Blome Co., Chicago, Ill.
Boone Brick, Tile & Paving Co., Boone, Ia.
The Buckeye Brick & Block Co., Zanesville, Ohio.
Carlyle Paving Brick Co., Portsmouth, O.
Clinton Paving and Building Brick Company, Clinton, Ind.
Danville Brick Co., Danville, Ill.
Kettle River Quarries Co., Minneapolis, Minn.
Metropolitan Paving Brick Co., Canton, O.
Michigan Paving Brick Co., Saginaw, Mich.
Peebles Paving Brick Co., Portsmouth, O.
Purington Paving Brick Co., Galesburg, Ill.
Saginaw Paving Brick Co., Saginaw, E. S., Mich.
Springfield Paving Brick Co., Springfield, Ill.
The Wassal Brick Co., Glouster, O.
U. S. Wood Preserving Co., New York City.
Wisconsin Granite Co., Chicago, Ill.
Wyckoff Pipe & Creosoting Co., New York City.

**Paving Blocks, Creosoted.**
F. J. Lewis Mfg. Co., Moline, Ill.
Kettle River Quarries Co., Minneapolis, Minn.
U. S. Wood Preserving Co., Moline, Ill.
Wyckoff Pipe & Creosoting Co., New York City.

**Paving Blocks, Granite.**
Wisconsin Granite Co., Chicago, Ill.

**Paving Brick.**
Boone Brick, Tile & Paving Co., Boone, Ia.
The Buckeye Brick & Block Co., Zanesville, Ohio.
Carlyle Paving Brick Co., Portsmouth, O.
Clearfield Clay Working Co., Clearfield, Pa.
Clinton Paving and Building Brick Co., Clinton, Ind.
Collinwood Shale Brick Co., Collinwood, O.
Danville Brick Co., Danville, Ill.
Frank B. Dunn, Conneaut, O.
F. B. Holmes & Co., Detroit, Mich.
Kentucky Vitrified Brick Co., Louisville, Ky.
Metropolitan Paving Brick Co., Canton, O.
Michigan Paving Brick Co., Saginaw, Mich.
Thomas Moulding Co., Chicago, Ill.
National Paving Brick Manufacturers Association, Terre Haute, Ind.
Peebles Paving Brick Co., Portsmouth, O.
Purington Paving Brick Co., Galesburg, Ill.
Saginaw Paving Brick Co., Saginaw, E. S., Mich.
Springfield Paving Brick Co., Springfield, Ill.
Terre Haute Brick and Pipe Co., Terre Haute, Ind.
Wabash Clay Mfg. Co., Veedersburg, Ind.
The Wassal Brick Co., Glouster, O.

**Paving Brick Association.**
National Paving Brick Manufacturers Association, Terre Haute, Ind.

**Paving Brick Machinery.**
Atlas Dryer Co., Cleveland, O.

**Paving, Cement Sidewalk.**
R. S. Blome Co., Chicago, Ill.

**Paving Contractors.**
American Asphaltum & Rubber Co., Chicago, Ill.
Carlson & Theselius, Chicago, Ill.
Central Paving Co., Chicago, Ill.
R. S. Blome Co., Chicago, Ill.
Wm. J. Erler, Terre Haute, Ind.
Ellisonite Construction Co., St. Louis, Mo.
Hoosier Construction Co., Indianapolis, Ind.
Indiana Paving Brick and Block Co., Indianapolis, Ind.
Indian Refining Co., New York City.
Sicilian Asphalt Co., New York City.
H. P. Streicher & Co., Toledo, O.
Western Construction Co., Lafayette, Ind.
Warren Asphalt Paving Co., Cambridge, Mass.
Wisconsin Granite Co., Chicago, Ill.
Wyckoff Pipe & Creosoting Co., New York City.

**Paving Filler.**
Barrett Manufacturing Co., New York City.
Indian Refining Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.

**Paving Materials.**
American Asphaltum & Rubber Co., Chicago, Ill.
Barrett Mfg. Co., New York City.
Frank B. Dunn, Conneaut, O.
Granite City Lime & Cement Co., Granite City, Ill.
Indian Refining Co., New York City.
Thomas Moulding Co., Chicago, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.
Standard Oil Co., New York City.
Wisconsin Granite Co., Chicago, Ill.
Wyckoff Pipe & Creosoting Co., New York City.

**Paving Pitch.**
Barrett Mfg. Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.
Michigan Paving Brick Co., Saginaw, Mich.

**Paving Tools.**
Carlson & Theselius, Chicago, Ill.
P. F. Connelly, El Reno, Okla.
Contractors' Tool Company, Philadelphia, Pa.
Iroquois Iron Works, Buffalo, N. Y.
John Stortz & Son, Philadelphia, Pa.
Zeiser Bros., Berwick, Pa.

**Pipe Coatings.**
American Asphaltum and Rubber Co., Chicago, Ill.
Barrett Mfg. Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Pipe Dip.**
American Asphaltum & Rubber Co., Chicago, Ill.
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Pipe Dip and Coatings.**
American Asphaltum & Rubber Co., Chicago, Ill.
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Pipe Manufacturers.**
McWane Pipe Works, New York City.
Wyckoff Pipe & Creosoting Co., New York City.

**Pitch.**
Barrett Mfg. Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.

**Pitch Filler.**
Barrett Mfg. Co., New York City.

**Plows.**
Parlin & Orendorff, Canton, Ill.
Shunk Plow Co., Bucyrus, O.

**Portland Cement.**
Alma Cement Co., Wellston, O.
Alpha Portland Cement Co., Alpha, N. J.
Alsen's Am. Portland Cement Co., New York City.
American Cement Co., Philadelphia, Pa.
Atlas Portland Cement Co., New York City.
Chicago Portland Cement Co., Chicago, Ill.
Dexter Portland Cement Co., Philadelphia, Pa.
French, Samuel H. & Co., Philadelphia, Pa.
Gabriel & Schall, New York City.

# BUSINESS DIRECTORY—CONTINUED.

F. B. Holmes & Co., Detroit, Mich.
Lesley & Trinkle, Philadelphia, Pa.
Lehigh Portland Cement Co., Allentown, Pa.
Marquette Cement Mfg. Co., Chicago, Ill.
Meacham & Wright, Chicago, Ill.
Peninsular Portland Cement Co., Jackson, Mich.
St. Louis Portland Cement Co., St. Louis, Mo.
Superior Portland Cement Co., Cincinnati, O.
United Kansas Portland Cement Co., Kansas City, Mo.
Universal Portland Cement Co., Chicago, Ill.
Charles Warner & Co., New York.
Charles Warner Co., Wilmington, Del.

**Power Transmission.**
Geo. V. Cresson Co., Philadelphia, Pa.
Jeffrey Mfg. Co., Columbus, O.

**Pumps.**
Harris Air Pump Co., Indianapolis, Ind.

**Rapid Calculation.**
C. C. Brain, New York City.

**Refuse Destructors.**
Power Specialty Co., New York City.

**Reinforced Concrete Sewers.**
General Fireproofing Co., Youngstown, Ohio.
Lock Joint Pipe Co., New York City.

**Reservoirs, Concrete.**
R. S. Blome Co., Chicago, Ill.

**Road Culverts.**
American Rolling Mill Co., Middletown, O.
Canton Culvert Co., Canton, O.
R. C. McWane, New York City.

**Road Oils.**
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.
Standard Oil Co., New York City.

**Road Machinery.**
Austin & Western Co., Ltd., Chicago, Ill.
Buffalo Steam Roller Co. Buffalo, N. Y.
J. I. Case Machine Co., Racine, Wis.
Parlin & Orendorff, Canton, Ill.
Shunk Plow Co., Bucyrus, O.

**Road Plows.**
Parlin & Orendorff, Canton, Ill.
Shunk Plow Co., Bucyrus, O.

**Road Rollers.**
Austin & Western Co., Ltd., Chicago, Ill.
Buffalo Steam Roller Co., Buffalo, N. Y.
J. I. Case Machine Co., Racine, Wis.
Enterprise Mfg. Co., Columbiana, O.
Erie Machine Shop, Erie, Pa.
Iroquois Iron Works, Buffalo, N. Y.
Kelley-Springfield Road Roller Co., Springfield, O.

**Road Tar.**
Barrett Mfg. Co., New York City.

**Rock Crushers.**
Austin & Western Co., Ltd., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.

**Rock Drills.**
Jeffrey Mfg. Co., Columbus, O.

**Roofing.**
Barrett Mfg. Co., New York City.
General Asphalt Products Supply Agency, New York City.
F. J. Lewis Mfg. Co., Moline, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.
Warren Brothers Company, Boston, Mass

**Roofing Material.**
American Asphaltum & Rubber Co., Chicago, Ill.
Barrett Mfg. Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.
Warren Brothers Company, Boston, Mass

**Rope Transmission.**
Geo. V. Cresson Co., Philadelphia, Pa.
The Jeffrey Mfg. Co., Columbus, O.

**Sand.**
Granite City Lime & Cement Co., Granite City, Ill.

**Sand Dryers.**
Atlas Dryer Co., Cleveland, O.
F. D. Cummer & Son, Cleveland, O.

**Sand, Filter.**
Red Wing Filter Sand Co., Red Wing, Minn.

**Sanitary Carts.**
Geo. H. Holzbog & Bro., Jeffersonville, Ind.

**Sarco.**
Standard Asphalt & Rubber Co., Chicago, Ill.

**Scrapers.**
Austin & Western Co., Chicago, Ill.

**Scraper Blades.**
Shunk Plow Co., Bucyrus, O.

**Sewage Disposal.**
City Wastes Wastes Disposal Co., New York City.
Power Specialty Co., New York City.

**Sewer Braces.**
Kalamazoo Foundry & Machine Co., Kalamazoo, Mich.
The Potter Mfg. Co., Indianapolis, Ind.

**Sewer Castings.**
Duplex Foundry & Mfg. Co., Cleveland, O.

**Sewer Contractors.**
Wm. J. Erler, Terre Haute, Ind.
The Potter Mfg Co., Indianapolis, Ind.
Sanitary Sewer Construction Co., Jackson, Mich.
H. P. Streicher & Co., Toledo, O.

**Sewer Machines.**
Potter Mfg. Co., Indianapolis, Ind.

**Sewer Pipe.**
P. Bannon Sewer Pipe Co., Louisville, Ky.
Buckeye Fire Clay Co., Urichsville, O.
W. E. Dee Clay Mfg. Co., Chicago, Ill.
General Fireproofing Co., Youngstown, Ohio.
F. B. Holmes & Co., Detroit, Mich.
Lock Joint Pipe Co., New York City.
Lewis McNutt, Brazil, Ind.
Schaeffer & Gengnagel, Dayton, O.
H. Stevens' Sons Co., Macon, Ga.

**Sewer Pipe, Reinforced Concrete.**
General Fireproofing Co., Youngstown, O.
Lock Joint Pipe Co., New York City.

**Sewer Trap.**
Perfect Sewer Trap Mfg. Co., New York City.

**Sheet Contractors' Supplies.**
Standard Asphalt & Rubber Co., Chicago, Ill.

**Sidewalk Forms.**
Zeiser Bros., Berwick, Pa.

**Sidewalk Tools.**
P. F. Connelly, El Reno, Okla.
Contractors Tool Co., Philadelphia, Pa.
John Stortz & Son, Philadelphia, Pa.
Zeiser Bros., Berwick, Pa.

**Sprinkling Wagons.**
Austin & Western Co., Ltd., Chicago, Ill.
E. D. Etnyre & Co., Oregon, Ill.
Kindling Machine Co., Milwaukee, Wis.
Studebaker Bros. Mfg. Co., South Bend, Ind.

**Standard Rattlers.**
Tinius Olsen & Co., Philadelphia, Pa.

**Steel Tape.**
Lufkin Rule Co., Saginaw, Mich.

**Stone Pavements.**
Cleveland Stone Co., Cleveland, O.
Ohio Quarries Co., Chicago, Ill.

**Street Contractors' Supplies.**
Austin & Western Co., Ltd., Chicago, Ill.
Geo. H. Holzbog & Bro., Jeffersonville, Ind.
Iroquois Iron Works, Buffalo, N. Y.
Kelly-Springfield Road Roller Co., Springfield, O.

**Street Crossings.**
Cleveland Stone Co., Chicago, Ill.

**Street Flushing Machine.**
Kindling Machine Co., Milwaukee, Wis.

**Street Scrapers.**
Austin & Western Co., Ltd., Chicago, Ill.
Shunk Plow Co., Bucyrus, O.

**Street Sweepers.**
Austin & Western Co., Ltd., Chicago, Ill.
Studebaker Bros. Mfg. Co., South Bend, Ind.

**Surveyors' Instruments.**
Bausch-Lomb Optical Co., Rochester, N. Y.
W. & L. E. Gurley Co., Troy, N. Y.

**Tar and Pitch.**
Barrett Mfg. Co., New York City.

**Tar, Coal.**
Barrett Mfg. Co., New York City.

**Taroline.**
F. J. Lewis Mfg. Co., Moline, Ill.

**Tar Products.**
Barrett Mfg. Co., New York City.

**Tar, Road.**
Barrett Mfg. Co., New York City.

**Tarvia.**
Barrett Mfg. Co., New York City.

**Testing Chemists.**
Dow & Smith, New York City.
J. W. Howard, New York City.
Henry S. Spackman Engineering Co., Philadelphia, Pa.
Lehigh Valley Testing Laboratory, Allentown Pa.

**Testing Laboratories.**
J. W. Howard, New York City.
R. W. Hunt & Co., Chicago, Ill.
Lehigh Valley Testing Laboratory, Allentown Pa.
Henry S. Spackman Engineering Co., Philadelphia, Pa.
Tinius Olsen & Co., Philadelphia, Pa.

**Testing Machinery.**
Tinius Olsen & Co., Philadelphia, Pa.

**Traction Engines.**
J. I. Case Machine Co., Racine, Wis.

**Transmission Outfits.**
Geo. V. Cresson Co., Philadelphia, Pa.
The Jeffrey Mfg. Co., Columbus, O.

**Trench Machines.**
The Potter Mfg. Co., Indianapolis, Ind.

**Tube Mills.**
Krupp (Thos. Prosser & Son, New York City.)

**Valves.**
Simplex Valve and Meter Co., Philadelphia Pa.

**Varnish Gums.**
Standard Asphalt & Rubber Co., Chicago, Ill.

**Water Pipe.**
Lock Joint Pipe Co., New York City.
McWane Pipe Works, New York City.

**Water Pipe Joints.**
A. L. Holmes, Grand Rapids, Mich.

**Waterproofing.**
American Asphaltum & Rubber Co., Chicago, Ill.
Aquabar Co., Philadelphia, Pa.
Barrett Mfg. Co., New York City.
General Asphalt Products Supply Agency, New York City.
Sandusky Portland Cement Co., Sandusky, O
Standard Asphalt & Rubber Co., Chicago, Ill.

**Waterproofing for Cement.**
Aquabar Co., Philadelphia, Pa.
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Waterproofing for Concrete.**
American Asphaltum & Rubber Co., Chicago, Ill.
Aquabar Co., Philadelphia, Pa.
Barrett Mfg. Co., New York City.
Standard Asphalt & Rubber Co., Chicago, Ill.

**Water Meters.**
Buffalo Meter Co., Buffalo, N. Y.
Simplex Valve and Meter Co., Philadelphia Pa.

**Water Meter Boxes.**
H. W Clark, Mattoon, Ill.
Ford Meter Box Co., Hartford City, Ind.
Grand Rapids Meter Box Co., Grand Rapids Mich.

**Water Works Contractors.**
Gas Power Co., New York City.

**Waterworks Supplies.**
Buffalo Meter Co., Buffalo, N. Y.
H. W. Clark, Mattoon, Ill.
Ford Meter Box Co., Hartford City, Ind.
Gas Power Co., New York City.
Grand Rapids Meter Box Co., Grand Rapids, Mich.
Harris Air Pump Co., Indianapolis, Ind.
Lock Joint Pipe Co., New York City.
McWane Pipe Works, New York City.
Red Wing Filter Sand Co., Red Wing, Minn.
Simplex Valve & Meter Co., Philadelphia, Pa.

**Wheelbarrows.**
Austin & Western Co., Ltd., Chicago, Ill.

**Wheel Scrapers.**
Austin & Western Co., Ltd., Chicago, Ill.

**Wire-Cut Lug Brick.**
Frank B. Dunn, Conneaut, O.

**Wood Pavements.**
Kettle River Quarries Co., Minneapolis, Minn
Republic Chemical & Creosoting Co., Indianapolis, Ind.
U. S. Wood Preserving Co., New York City.

**Wood Preservatives.**
Barrett Mfg. Co., New York City.
F. J. Lewis Mfg. Co., Moline, Ill.

**Wood Split Pulley.**
The Jeffrey Mfg. Co., Columbus, O.


# THE BEST BOOKS FROM THE BEST LIBRARY

The back numbers of MUNICIPAL ENGINEERING MAGAZINE form the best library of information on municipal engineering and contracting, and cement and concrete construction.

We have a limited supply on hand which we wish to dispose of, and will send six numbers containing the best articles on any of the following subjects on receipt of $1.00, or twelve numbers for $2.00.

**PAVING. (Brick, asphalt, wood, bitulithic or macadam.)**
**CONSTRUCTION OF SEWERS.**
**SEWAGE DISPOSAL.**
**WATER WORKS.**
**STREET LIGHTING.**
**GARBAGE DISPOSAL. (Collection and Destruction.)**
**BRIDGES. (Steel, stone or concrete.)**
**CONCRETE CONSTRUCTION. (Dams, reservoirs.)**
**CONCRETE CONSTRUCTION. (Blocks and Bricks.)**
**CEMENT MANUFACTURE AND USE.**
**PUBLIC ACCOUNTING.**
**STREET CLEANING.**
**ROAD BUILDING.**

Numerous other subjects ably treated in the back numbers may also be included. If you want special information on any of these subjects you can get more for a dollar here than a like expenditure would procure in any other way.

Let us know what subject you are most interested in and what numbers you already have and we will select what is best for your purpose.

To make the best of this excellent bargain your order should be sent at once.

**MUNICIPAL ENGINEERING CO.**
**Indianapolis : Indiana**

## CARL VON HARTZFELT

**METALLURGICAL CHEMIST**

**Wheeling, W. Va.**

Plans, specifications, estimates and supervision for **Continuous Industrial Alcohol Distillery Apparatus**, for light, heat and power purposes from natural gas and portable stills for vegetable waste matter. Economy and rapidity of construction a specialty. Unquestionable references.

ACTING DIRECTOR OF

**THE CONTINENTAL NATURAL GAS ALCOHOL CO.**

WHEELING, W. VA., U. S. A.

See Harper's Weekly Oct. 3, 1908 — Patent Serial No. 450,294 Aug. 25

---

## WILLIAM D. MARKS, Ph. B., C. E.

**Consulting Engineer & Statistician.**

**Electric Railways, Oil Motor Cars, Gas Works, Electric Lighting Stations.**

**Experienced in Municipal Causes.**

**Offices, 623-624 Park Row Building, NEW YORK.**

---

## Clifford A. Tinker

Landscape and Building Architecture and Civil Engineering. Concrete Work a Specialty.

**Rooms 5-6-7, Elm Park Block Westfield, Mass.**

---

## HENRY S. SPACKMAN ENGINEERING CO.

**INDUSTRIAL AND CHEMICAL ENGINEERS**

Inspection before shipment at point of manufacture of Creosoted Wood and Vitrified Paving Blocks, Cement, Steel, etc.

**Chemical Analyses, Physical Tests.**

**Home Office: Chemical and Physical Laboratories, 42 North 16th Street, Philadelphia.**

**Branch Cement Laboratory, Leinbach Bldg., Bethlehem, Penna.**

---

## J. W. HOWARD, C. E.,

**Consulting Engineer on Construction, Roads and Pavements.**

Also Testing Laboratory for all Pavement and Road Materials. Expert in Pavement Litigation.

**1 BROADWAY NEW YORK**

---

## S. BENT RUSSELL

Mem. Am. Soc. C. E.

**CONSULTING CIVIL ENGINEER**

Water Works and Water Purification Plans, Estimates, Etc. Superintendence.

**408 Locust Street : St. Louis, Mo.**

---

## CITY-WASTES DISPOSAL CO.

(Organized from the staff of the late Col. Geo. E. Waring, Jr.)

NEW YORK CITY, 156 Fifth Avenue.

CONSULTING AND CONTRACTING IN SEWERAGE, SEWAGE DISPOSAL, GARBAGE AND REFUSE DISPOSAL AND STREET CLEANING.

---

## H. G. TYRRELL

**Civil Engineer**

**Designer and Engineer for All Kinds of Bridges and Structures**

Special attention to selection of Economic Types. Plans and specifications furnished for Town and County Bridges

Author of "Concrete Bridges and Structures"

**Address EVANSTON, ILL.**

---

## DABNEY H. MAURY

M. Am. Soc. C. E.; M. Am. Soc. M. E.

**CONSULTING ENGINEER**

**129 N. Jefferson Ave., Peoria, Ill.**

**Water Works, Increase of Water Supply, Steam and Hydraulic Power Plants, Appraisals.**

---

## B. H. COLBY

**M. AM. SOC. C. E.**

**...Civil and Consulting Engineer...**

Plans, Specifications, Estimates and Superintendence For Sewerage Systems, Sewage Disposal, Water Supply, Water-Works, Dams, Reservoirs, Street Paving and County Roads, Landscape Work for Parks and Cemeteries, Topographical Surveys, Examinations and Reports.

**812-813 Security Bldg., St. Louis, Mo.**

---

## Wilbur J. Watson & Co.

**Citizens Bldg., Cleveland, O.**

**ENGINEERS**

Expert designers and inspectors of Bridges, Buildings and other Engineering Structures, in all materials for Cities, Counties, Railways, etc.

Standard Plans for reinforced concrete highway bridges. Description of Standard Plans, also references and terms on request. Correspondence solicited.

---

## Harry T. Barker

**Civil Engineer**

Plans, Specifications, Estimates and Superintendence for Municipal Works. Sewerage, Heavy Masonry and Foundations, Pavement and Road Building, Surveys and Land Subdivision. Water Supply Investigations.

**BEAVER FALLS, PENNA.**

---

## MASON L. BROWN,

**CIVIL ENGINEER AND LANDSCAPE GARDENER**

**921, 922, 923 CHAMBER OF COMMERCE, DETROIT, MICHIGAN.**

SURVEYS PLANS SPECIFICATIONS, ESTIMATES, SUPERINTENDENCE, FOR { ELECTRIC RAILWAYS, SEWERAGE, WATER SUPPLY, PAVING, MACADAMIZING, PARKS, CEMETERIES, DEVELOPMENT OF SUBURBAN PROPERTIES.

**ATLANTA, GA. CANDLER BLDG.**

---

## Hazlehurst & Anderson

**CONSULTING MUNICIPAL ENGINEERS**

James Nisbet Hazlehurst Chas. L. B. Anderson

## RUDOLPH HERING AND GEORGE W. FULLER

**Hydraulic Engineers and Sanitary Experts**

**170 BROADWAY, NEW YORK**

Water Supply, Water Purification, Water Power. Sewerage and Sewage Disposal.
Examinations of Projects. Plans, Specifications and Estimates of Cost.
Construction Superintended.

---

# HEENAN Destructors

Sanitary and Economical Disposal of City Refuse by Most Advanced European Method

**Power Specialty Co.,** 111 Broadway, **New York**

---

## FRANK M. TURNER

**CIVIL AND CONSULTING ENGINEER**

Plans, Specifications, Surveys and Estimates for Water Works, Sewerage, Paving, Electric and Steam Roads and All Kinds of Municipal Improvements.

**914-915 Reibold Bldg.** **DAYTON, OHIO**

---

## GAS WORKS

**Complete Installations Repairing and Remodeling**
**Estimates and Plans Cheerfully Furnished**
**Correspondence Solicited**

**FRANK D. MOSES**

**147 EAST STATE STREET** **TRENTON, N. J.**

---

## JOHN C. SPARKS, B. Sc. F. C. S.

**INDUSTRIAL CHEMIST**

Examinations and improvements in industrial processes. Factories scientifically systematized. Water softening and clarifying plants installed. Processes investigated. Manufacturing costs reduced.

**16 Beaver Street** **New York City**

---

## W. & L. E. GURLEY

**TROY, N. Y.**

Civil Engineers and Surveyors Instruments
Standard Weights and Measures
Physical and Scientific Apparatus
*Write for Catalogues*

**Branch Factory : SEATTLE, WASHINGTON**

---

## Dow & Smith,

**Chemical Engineers.**

**A. W. DOW, PH. B.** **F. P. SMITH, PH. B.**

**Paving Inspection for Municipalities.**

**24-26 East 21st St.** **NEW YORK, N. Y.**

---

## Charles Cottingham

**CIVIL AND CONSULTING ENGINEER**

**DANVILLE, ILLINOIS**

Water Works, Water Purification, Sewerage, Sewage Disposal, Street Pavements, Electric Lighting, Topographical Surveys, Grade Systems.

---

## LEHIGH VALLEY TESTING LABORATORY.

**ENGINEERS and CHEMISTS.**

Standard cement testing. Inspection at the mills before shipment. Investigation and report on cement materials. Chemical analyses. Physical testing.

**ALLENTOWN, PA., and PITTSBURG, PA.**

---

Jno. J. Cone Robert W. Hunt A. W. Fiero
Jas. C. Hallsted D. W. McNaugher

## ROBERT W. HUNT & CO.

**Bureau of Inspection, Tests and Consultation**

71 Broadway, New York; 1121 The Rookery, Chicago
Monongahela Bank Bldg., Pittsburgh
Norfolk House, London.

Inspection of Rails and Fastenings, Cars, Locomotives, Pipe, Etc., Bridges, Buildings and other Structures. Chemical and Physical Laboratories. Cement Inspection and Testing.

---

## ALEXANDER POTTER, C. E.

**Hydraulic Engineer and Sanitary Expert**

**114 LIBERTY STREET, NEW YORK CITY**

**SEWERAGE AND SEWAGE DISPOSAL, WATER SUPPLY AND PURIFICATION, WATER AND ELECTRIC POWER**

Valuations of Existing Plants where MUNICIPAL OWNERSHIP is Contemplated—Expert Testimony—Plans and Estimates.

---

## CHARLES CARROLL BROWN

**M. Am. Soc. C. E.**

## CONSULTING ENGINEER,

**83 Commercial Club Bldg.**
**INDIANAPOLIS, IND.**

SPECIALTY: Municipal and Sanitary Work, Sewerage, Drainage, House Drainage, Paving, Water-Works, Sanitary Investigations of Water Supplies.

---

## J. F. LUCIUS

*Civil Engineer*

**908 HARTJE BLDG., PITTSBURG, PA.**

---

## JOHN FINAN

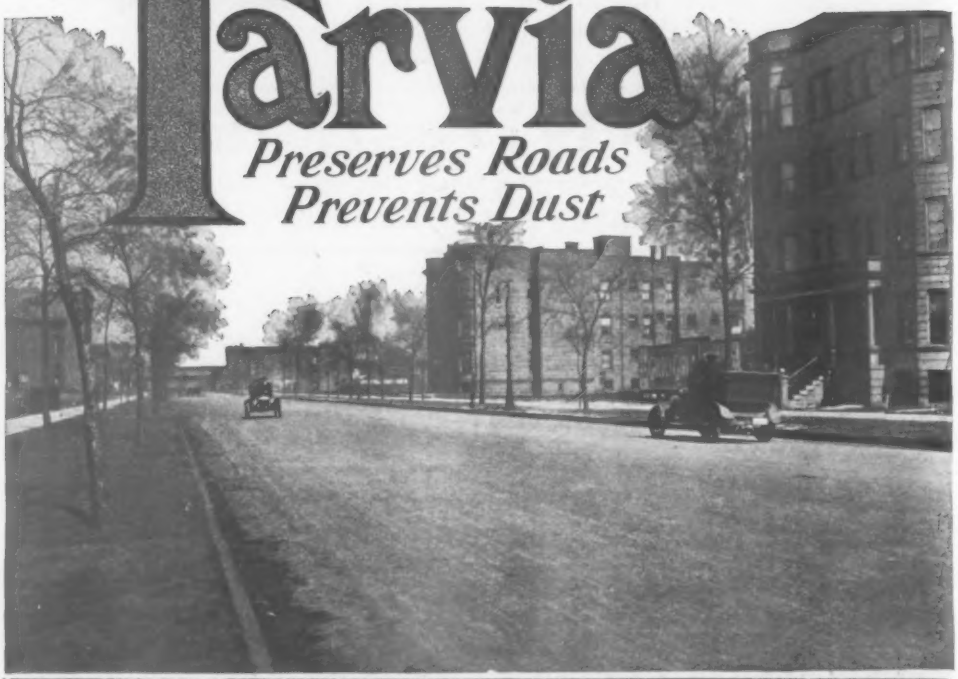
## CIVIL ENGINEER

**Municipal Engineering a Specialty**

**420 EAST AVENUE** **HAMILTON, OHIO**

# Tarvia

*Preserves Roads*
*Prevents Dust*



Michigan Boulevard, Chicago. Tarviated Road which shows no need of repair or resurfacing after two years of hard wear.

## The Success of TARVIA in Chicago

The City of Chicago has a splendid series of boulevards, most of which are paved with macadam and have become great automobile thoroughfares.

A few years ago the maintenance cost of macadam on these roads became excessive. New surfacing would be stripped off by the automobile within a few months, and the continual renewal made it a question whether the use of macadam on these boulevards should be continued. At the same time adjoining property suffered by reason of great clouds of dust, and continual water sprinkling failed to abate the nuisance.

The use of TARVIA has completely changed the situation. After a thorough trying-out in various experimental stretches, it is now used in vast quantities with great satisfaction to property owners, automobilists and Road Commissioners. The principal stretches of tarviated macadam are on Grand Boulevard, Oakwood Boulevard, Drexel Boulevard, Garfield Boulevard and Jackson Park, the total area being upward of 250,000 yards. In addition to this, 5,000 square yards of walk in Washington Park have been treated with TARVIA.

The effect of TARVIA on macadam boulevards is that of a *powerful binder* which cements the fine stone in a tough, rubber-like matrix from which automobile tires cannot tear it loose. A single application lasts for a season or more and shows beneficial results for several years.

Not only is the dust nuisance abated, but the cost of maintenance has been greatly reduced. Today the retaining of macadam on these boulevards is not questioned.

*Booklets illustrating Tarviated Roads all over the country free on request.*

## BARRETT MANUFACTURING COMPANY

| | | | | |
|---|---|---|---|---|
| New York | Chicago | Philadelphia | Boston |
| Pittsburg | New Orleans | Minneapolis | Cincinnati |
| Kansas City | Cleveland | St. Louis | London, Eng. |

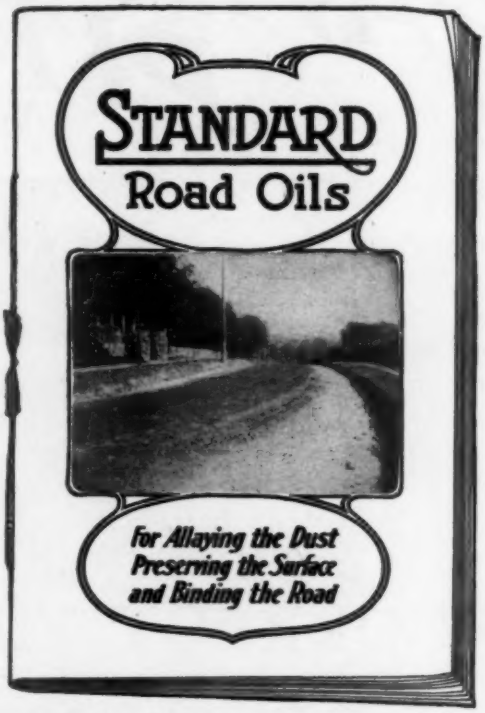
TRADE B MARK

# STANDARD

## Asphalt Road Oil
## Emulsifying Road Oil
## Macadam Asphalt Binder

*Experience and experiment have demonstrated that asphalt or oil with an asphaltum base are the only substances successfully applied to roads to insure permanency of dust relief and to maintain the roads in perfect condition*

*In our three preparations we offer products that are suitable for road construction or road maintenance. Adapted for all conditions of roads and for use in all localities.*




*Our free book (facsimile shown) treats of each of these three products at length explaining the uses for which they are particularly prepared, and furnishing information which will be found invaluable to Supervisors, Road Commissioners, State, County and Municipal authorities, and to owners of private estates.*

*A copy will be mailed free on request.*

**Asphalt Road Oil** is an asphalt-bearing oil and is intended for use on well-made roads as they are. One application if properly applied, sufficies for a season.

**Emulsifying Road Oil** is a lighter asphalt bearing oil so prepared that it will emulsify with water. It serves as a dust preventative, requires frequent application, and is used only on side roads where traffic is light—on private grounds or parks.

**Macadam Asphalt Binder** is a heavy product, almost solid asphaltum, used in constructing macadam and all other roads where asphaltic material is required.

THESE PRODUCTS CAN BE PROCURED AT

STANDARD OIL COMPANY, Road Oil Dept.,
26 BROADWAY, NEW YORK.

Kansas City, Kan. 115 Adams St., Chicago, Ill.

# Barrett's PAVING PITCH

Maryland Street, Indianapolis. Brick pavement filled with Barrett's Paving Pitch in 1896. Note its good condition today.

## THE CORRECT FILLER

Four Pavement Fillers are now Commonly used, Cement, Asphalt, Sand and Pitch

CEMENT allows for neither expansion nor contraction, and its use invites cracks and "blow-outs."

ASPHALT allows for expansion, but when the blocks return to normal size, it is not adhesive enough to follow, thus leaving cracks for water to get through to foundation.

SAND AND PITCH yield to both expansion and contraction, but sand naturally is not waterproof and water filters through it and disintegrates the road bed.

PITCH is the material used to waterproof tunnels and roofs of large buildings. It is absolutely unaffected by water. In every way it is the ideal pavement filler.

*BOOKLET ON REQUEST*

BARRETT MANUFACTURING COMPANY

New York Chicago Philadelphia Boston Cleveland Cincinnati
Minneapolis St. Louis Pittsburg Kansas City New Orleans London, Eng.

# "The Dust Nuisance Settled"

# LEWIS' Taroid SETTLES IT

THE BEST ROAD TAR
FOR MACADAM
BINDER

MAIN STREET, SHAWANO, WIS., TAROID PAVEMENT.

## Taroid Makes The Best Low Price Pavement

Taroid is the ideal Liquid Pitch for Roads. It is not merely a dust preventative but its use in connection with Macadam Pavements gives at once a first-class dustless, noiseless pavement and at very small expense.

Taroid is equally desirable on City Streets as well as Country Roads.

Taroid is today the Standard on all speed-ways where roads are subjected to great strain from speeding automobiles. None but the highest priced pavement could stand such hard usage.

Taroid can be used, at small cost, for repairing and resurfacing old and badly worn Macadam Pavements.

Taroid does away with all danger of horses slipping and automobiles skidding.

Taroid produces a smooth, clean, beautiful roadway.

Write for our Art Booklet and for further information which will be furnished by our competent Road Engineers.

**F. J. LEWIS MFG. CO., Good Roads Dept., 1160-1200 S. Robey St., CHICAGO**

**LEWIS McNUTT**

FOR ALL KINDS OF

**HOLLOW BUILDING BLOCKS**
**SEWER PIPE, FLUE LINING**

14 South Walnut Street
BRAZIL, INDIANA

Our special feature is anything in the Clay Goods Line in mixed or straight cars

*Clay Products*

**H. STEVENS' SONS CO.** Mfrs. of SEWER AND CULVERT PIPE

MACON, GA.
Locomotive Tile, Fire Brick, Etc.

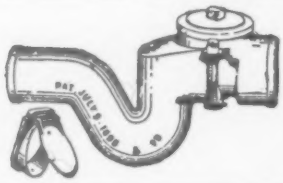
In two and a half feet lengths.
Deep Corrugated Sockets.
CORRESPONDENCE SOLICITED

**Troy, Ohio—Wagons.**

Each town becomes identified with one of its leading products. The Troy wagon distinguishes Troy, Ohio, as the linen collar is often thought of in connection with Troy, N. Y. The Troy Wagon Works Co. has established itself as the most prominent producer of dump wagons and dump boxes in America, because of its long experience in building wagons and because of the quality of its product. To call a wagon a Troy is equivalent to calling a spoon sterling — there is nothing "plated" about a Troy; it is solid, and built to last. In our Bulletin F we tell you how this is accomplished.

**Troy, N. Y.—Collars**

THE TROY WAGON WORKS CO., South Crawford Street, Troy, Ohio



**PERFECT SEWER TRAP MFG. CO.**

Sole owners of the LENHART PATENTS
Nos. 378,600 and 542,417

Will Improve the Sanitary Condition of Any City or Town

Medical advisers recommend it in every home. A perpetual preventive against back water and sewer gas. Architects give it their highest approval.

MAIN OFFICE OF THE COMPANY : 61 BEEKMAN STREET, NEW YORK CITY

**The MILLER and ADAMS**

**PATENTED SIPHONIC APPARATUS**

Of every description for operating

**BACTERIAL SEWAGE FILTERS : : : : SEPTIC TANK SYSTEMS**

Also siphonic apparatus of every description for operating Intermittent Flush Tanks for Flushing Street Sewers.

**PACIFIC FLUSH TANK CO.**

184 LA SALLE STREET. CHICAGO, ILL. Eastern Agency, 42 Broadway, New York City

M. J. BANNON, PRES. & GEN. MAN. P. BANNON, JR., V. P. & TREAS.

**P. BANNON SEWER PIPE CO.**

ESTABLISHED 1852 INCORPORATED

MANUFACTURERS OF

| | |
|---|---|
| Sewer and Culvert Pipe | Bannon's Patent Lidded Pipe for Steam Conduits |
| Wall Coping | Fire Brick |
| Flue Lining | Fire Clay |
| Grate Tile | Chimney Tops |
| Drain Tile | |

OFFICES: 508, 510, 512 WEST JEFFERSON STREET.
WORKS: 13TH & LEXINGTON

LOUISVILLE, KY.

**The Buckeye Fire Clay Co.,**

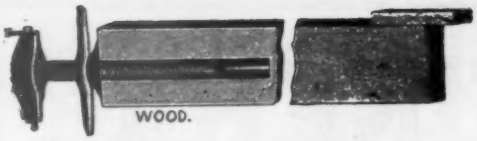
Urichsville, Ohio.

MANUFACTURERS OF

SALT GLAZED
VITRIFIED SEWER
AND CULVERT PIPE,

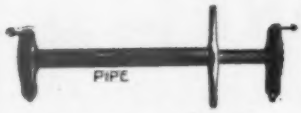
Wall Coping, Flue Lining, Chimney Tops and Fire Brick.

Correspondence Solicited.




Write for Circulars, Price List.

# Potter Safety Trench Braces




Patented January 25, 1898.

## THE POTTER MFG. CO.

INDIANAPOLIS, IND.

Office and Factory, 3505 East Washington Street

---

# WM. E. DEE CLAY MFG. CO.

## PROPRIETORS OF MECCA CLAY WORKS

Manufacturers of

**Standard and Double Strength**

## Sewer Pipe, Drain Tile, Culvert Pipe
## Well Tubing, Flue Lining

WORKS { Mecca, Parke County, Ind., on C. & E. I. R. R.
{ Newport, Vermilion Co., Ind., on C. & E. I. R. R.

CHICAGO OFFICE: 214-215 Royal Insurance Bldg.

---

DOT ROLLER

**Konkurt Metal**
(New Secret Metal)
**Cement Tools**
For Every Purpose
Outwears Everything
LARGEST STOCK
CATALOGS
**ASPHALT TOOLS**

**THE CONTRACTORS' TOOL CO.**
Seventh and Arch Sts., Philadelphia, Pa.

---

**Cement Workers' Tools**
NONE BETTER. FROM 30 CTS. UPWARDS

Most complete line of these tools in the U. S. Bronze or Iron. Correct in material and shape. Write for Catalogue. Prompt shipments. Special Tools to Order.

**JOHN STORTZ & SON, Manufacturers**
218 Vine Street, Philadelphia, Pa.

---

**"I AM FOR SIDEWALK MEN"**

Lack of experience will not interfere with you finishing a walk in first-class shape if you use me

ADJUSTABLE TROWEL IN OPERATION

**Send for Catalogue of Connelly's Adjustable Cement Finishing Tools**

showing cuts of five other practical tools that fit the adjustable handle, namely: Edger, jointer, pointing trowel, and a combination curbstone finisher. We make special mention of the curbstone finisher, as it is the only one of its kind that in one operation completely finishes the curb, cuts the curb joint and turns the edge, thereby doing away with all previous operations. Address all communications to

**P. F. CONNELLY :: El Reno, Oklahoma**

# BITU-MINERAL
## PAVING CEMENT

Is the only paving cement on the market that will produce bituminous streets that are unaffected by water and weather conditions.

Bitu-Mineral Pavement, Butler Avenue, Indianapolis, Indiana

## BITU-MINERAL CEMENT

Enables contractors in all parts of the country to build the most durable bituminous streets at proper, not unreasonable prices. Contractors and municipal authorities should write and learn of the unhampered opportunities they now have to build Bitu-Mineral and other approved forms of bituminous macadam pavements at a minimum first cost.

**NATIONAL BITUMEN CO., Indianapolis, Ind.**

# THE THINGS YOU MOST DESIRE

## IN A BRICK PAVEMENT

# ARE POSSIBLE

¶ The noise of traffic can be reduced to a minimum. The pavement can be made easy of traction, and will not be slippery when it is wet or full of frost. Seepage of water to the foundation will be impossible.

¶ These desirable conditions can be obtained by the use of *SARCO ASPHALT FILLER.*

¶ *THE FILLER* that does not become soft and track in hot weather.

**Have You a Copy of our Booklet 105 F?**

**.... Sent on Request ....**

## STANDARD ASPHALT AND RUBBER COMPANY

205 LA SALLE STREET

NEW YORK CHICAGO KANSAS CITY

**ASPHALT PLANTS**
Stationary and Portable
(One Car—Two Car)

Write for Catalogue and References

**ROTARY DRYERS**
For Drying Everything

THE F. D. CUMMER & SON COMPANY, CLEVELAND OHIO

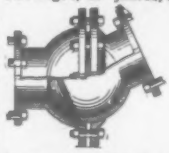
**RUGGLES-COLES DRYERS**
For Sand, Clay, Rock, Marl, All Materials
NEW YORK CHICAGO

**JEFFREY** ELEVATING AND CONVEYING SYSTEMS FOR ALL PURPOSES. DRILLS, SCREENS, LOCOMOTIVES, CRUSHERS, ETC.
"WRITE FOR CATALOGS, SERIES SB."
THE JEFFREY MANUFACTURING CO., Columbus, Ohio, U. S. A.

**BOORMAN'S "NOFLUX" ASPHALT**
99 PER CENT. PURE BITUMEN Refined from liquid asphalt to any consistency required
BEST ASPHALT FOR PAVING, BRICK FILLERS AND WATERPROOFING
GENERAL ASPHALT PRODUCTS SUPPLY AGENCY : 59 Pearl Street, New York City
T. HUGH BOORMAN, General Mgr. Cable Address: "Evancallan, New York" KITCHELL M. BOORMAN, A.B., Consulting Engineer

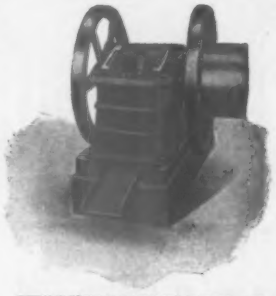
**Atlas Dryers—Atlas Paving Plants**
Possess Extraordinary Advantages Over All Others
THE ATLAS DRYER CO.
W. M. Cummer, President CLEVELAND, O.

HOLMES FLEXIBLE JOINT
Pat. Aug. 4, '96—Jan. 12, '04



FLANGED JOINT for WATER PIPE

**A. L. HOLMES**
GRAND RAPIDS, MICH.
Manufacturer of
Flexible and Expansion Joints for Water Pipes, Gas Pipes, Oil Pipes, Air Pipes, and any purpose where a Flexible or Expansion Joint is desired. Made in sizes for Pipes from ½ to 48 inches in diameter and any pressure. Have been used for 25 years. Flanged, hub or screwed ends. The strongest, easiest to use, low first cost, the best.



**BUCHANAN**
ALL STEEL
ROCK BREAKERS
Portable and Stationary Plants Complete
Sizes 9" x 14" up to 30" x 60"
Capacities from 50 to 3000 Tons per day
STYLE "C" CRUSHING ROLLS—18" x 12" TO 60" x 60"
SEND FOR CATALOGUE NO. 5
GEO. V. CRESSON CO.
Philadelphia, Pa. 90 West St., New York, N. Y.

*Prompt Shipments*

BEST EXTENSIBLE TRENCHING BRACE MADE
KALAMAZOO FDRY. & MACHINE CO MICHIGAN
504 EAST MAIN ST.

**FOR A QUARTER**
(TWO- OR ONE-CENT STAMPS WILL DO)
We will send you six different numbers of MUNICIPAL ENGINEERING of issues prior to 1902. All are valuable. Regular price, 25 cents each, but they are surplus stock which must be disposed of.
MUNICIPAL ENGINEERING CO.

# SCRAPER BLADES

For any make machine carried in stock
at greatly reduced prices

Also Road Plows — Special Price to Jobbers

THE SHUNK PLOW CO., BUCYRUS, O.

MADE BY THE MILE!
SOLD BY THE FOOT!

SIASTEX
WATERPROOFING FABRIC

IT IS AN
ASPHALTED
TEXTILE

MANUFACTURED ONLY BY

THE SICILIAN ASPHALT
PAVING CO.

41 PARK ROW, NEW YORK

GABRIEL & SCHALL

205 PEARL ST., NEW YORK

Sole Importers of the only

Genuine "Brunswick" Asphalt Mastic

Trade Mark, Reg.
in U. S. Pat. Office

Our "Brunswick" is branded as here shown.

All Others are Imitations

BRUNSWICK G.&S. GERMANY

ALSO IMPORTER OF HIGHEST GRADE OF

Soft BITUMEN

Well Known for 25 Years

Your Good Work Is Your Best Advertisement

And to do good work you must have the right materials to work with. Let us tell you about the big success made by our

PIPE DIP, BRICK FILLER, PAVING CEMENT, MASTIC, WATERPROOFING

A ten years' record for superior excellence. Let us refer you to *Engineers Who Know*. Please state which one of our products you are interested in.

AMERICAN ASPHALTUM & RUBBER CO.
Dept. 6, 600 to 610 Harvester Bldg.
CHICAGO, ILL.

Uvalde Asphalt Company

1 Broadway ... NEW YORK

FAIRFIELD REFINED ASPHALT
FAIRFIELD FILLER
FAIRFIELD ANTI-DUST ASPHALT

The Impervious Product Co.
No. 213 St. Paul St. Baltimore, Md.

Pure Silica Sand

The Best for Filtration Purposes

RED WING SILICA SAND is celebrated for its purity, cleanliness, uniformity of size and filtration qualities. Used in all parts of the United States.

We have something of interest to Water Companies

Red Wing Filter Sand Co.
Red Wing, Minn.

YOU WILL FIND IN

# TEXACO

## PAVING CEMENT

**THE MOST VALUABLE QUALITY FOR DURABLE PAVING CONSTRUCTION—STABILITY**

DEPT. NEW YORK

## THE TEXAS COMPANY

**New York Philadelphia Providence St. Louis New Orleans Houston**
**Port Arthur Dallas and El Paso, Texas**

---

**HEAVY LIQUID ASPHALT BINDER**
FOR
**ROAD CONSTRUCTION**

**LIQUID ASPHALT, ROAD PRESERVER**
AND
**DUST ELIMINATOR**

We have the method, the materials and the knowledge.
We have builded good roads: We are building fine roads.

## INDIAN REFINING COMPANY

(INCORPORATED)

GENERAL OFFICES:
FIRST NATIONAL BANK BLDG.
CINCINNATI, O.

NEW YORK OFFICE OF
ROAD PRESERVING DEPT.
115 BROADWAY

---

**Capacity—40,000 tons per year.** **99.6 per cent. bitumen.**

## GLOBE ASPHALT CO.

REFINERS OF

## "OBISPO"

BRAND

**CALIFORNIA ASPHALT**

LIQUID AND SOLID

**Samples and prices furnished to responsible parties not connected with the Asphalt trust.**

**Address all inquiries,**
**405 Blackwell Bldg., PITTSBURG, PA.**

# Wisconsin Granite Co.

**PAVING BLOCKS**
**CROSS WALKS**
**DIMENSION STOCK**

**CRUSHED GRANITE**

In All Sizes for Concrete, Bitulithic Granitoid and Macadam Work.

HARDEST AND STONGEST GRANITE QUARRIED

Quarried at Berlin, Montello, Red Granite, Waupaca, Utley, Ableman

ADDRESS

**CHAMBER OF COMMERCE BUILDING, .·. CHICAGO, ILL.**

# "Wyckoff" Wood Paving Blocks

## ARE SUPERIOR To All OTHERS

Are made from the best lumber obtainable. Are HONESTLY MANUFACTURED, thoroughly impregnated with creosote oil and will NEVER DECAY. Twenty-eight years experience.

THE WYCKOFF PIPE & CREOSOTING CO., (Incorporated)

50 Church Street, NEW YORK, N. Y. Works: PORTSMOUTH, VA.

# GOOD PAVEMENTS PROPERLY CONSTRUCTED SAVE MONEY

Our printed matter contains important paving facts. Write for it today.

There is real economy in a good pavement properly laid. That is why it pays to have your work done by paving specialists. Our long practical experience in all kinds of paving work enables us to produce the best pavement possible out of the material you wish to use. We make a specialty of BITULITHIC but will gladly furnish bids on any material desired.

**HOOSIER CONSTRUCTION COMPANY**

332 American Central Life Bldg. INDIANAPOLIS, INDIANA

# Saves Labor
# Saves Expense

For water-works companies the American Standard Water-Works Bookkeeping System saves labor, which is a large item, and insures economy, which is important. If your bookkeeping isn't right everything is apt to go wrong.

If you want to start right send your order for the books now.

## WHAT IT IS

It is a comprehensive system of bookkeeping, founded upon the latest and best accountant methods as applied to the needs of Water Companies.

## WHAT IT DOES

It saves time and labor, eliminates unnecessary entries, reduces liability to mistakes, and simplifies the whole method of the keeping of records. ALL THIS SAVES MANY TIMES THE COST OF THE BOOKS.

## HOW IT WAS DEVELOPED

The American Water-Works Standard Bookkeeping System is based upon a careful study of methods in use by Water-Works Companies throughout the country, and embraces the good features of them all. It is the outgrowth of a competition instituted by MUNICIPAL ENGINEERING MAGAZINE, in which prizes were offered for the best set of forms. In response to this call many blanks were received from points throughout the United States and Canada, and after a careful examination of them by a committee, the prizes were awarded.

NO ONE SET, however, was found to embrace all the good points of others and many of the better ones were cumbersome in the extreme. These forms were afterwards taken in hand by competent accountants and carefully studied, and, after a thorough sifting and pruning, the best features of them all were embodied in The American Water-Works Standard Bookkeeping System.

## IT COMPRISES

(1) A Rated Water Register for flat-rate consumers; (2) Metered Water Register; (3) Special Register; (4) Delinquent Register; (5) Cash Received Book; (6) Cash Disbursement and Voucher Record; (7) General Ledger; (8) Journal; (9) Card Index System. Books can be ordered separately.

## THE SYSTEM IS COPYRIGHTED

**and Books Made Under Patent**

We will protect, in every lawful way, and promptly prosecute any infringements of our rights.

It is the best Bookkeeping System for Water Companies ever devised and the books are the cheapest.

A large number of Water Companies under both public and private ownership in every state in the Union are now using this system.

It has so many real advantages that it is worth your while to investigate.

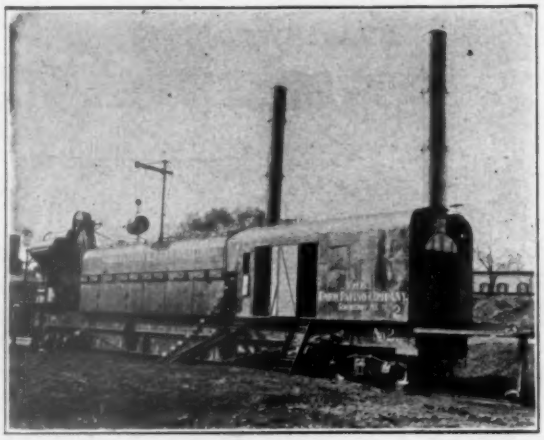
Write for booklet giving full description.

## MUNICIPAL ENGINEERING COMPANY

**Commercial Club Building** **Indianapolis, Indiana**

# HERE IS A WONDERFUL WORKER

**The Merriman One Car Asphalt Plant Accomplishes Surprising Results**



If you have never seen this plant in operation, you will be amazed at the amount of work it does. Your amazement will increase when you see how perfectly every detail works—the smooth, easy way it runs and the uniform results secured. It was designed for a special purpose by a man who knew exactly what was wanted and it will meet the most exacting requirements of any paving contractor. Unexcelled for simplicity, durability, efficiency and for saving time and labor.

*Investigate and save money*

ALL ON ONE CAR

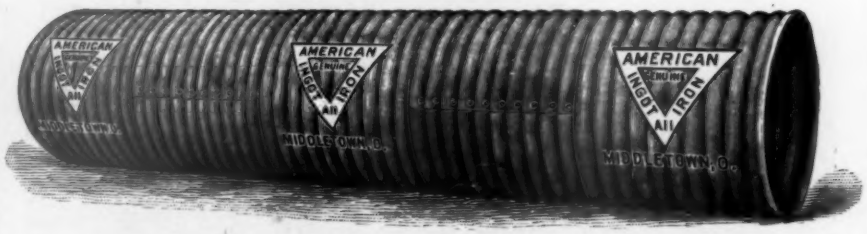
We are also manufacturers of Asphalt Mixers. We will be pleased to submit prices on application.

**EAST IRON & MACHINE COMPANY : LIMA, OHIO**

**STEEL RUSTS IN THE GROUND BUT CORRUGATED METAL CULVERTS MADE FROM**

# AMERICAN INGOT IRON

**RESIST CORROSION**




NONE GENUINE WITHOUT THIS TRADE-MARK ON EACH SECTION

**WRITE FOR BOOKLET "ME" ON**

**"AMERICAN INGOT IRON RUST RESISTING PLATES"**

## The AMERICAN ROLLING MILL COMPANY

500 Grand Avenue, MIDDLETOWN, OHIO

MERIWETHER SYSTEM

# CONTINUOUS REINFORCED CONCRETE PIPE

(PATENTED)

Laying Forty-Eight Inch Pipe, Wilmington, Delaware, Sewer
Alexander J. Taylor, Engineer of Sewers

## LOCK JOINT PIPE COMPANY

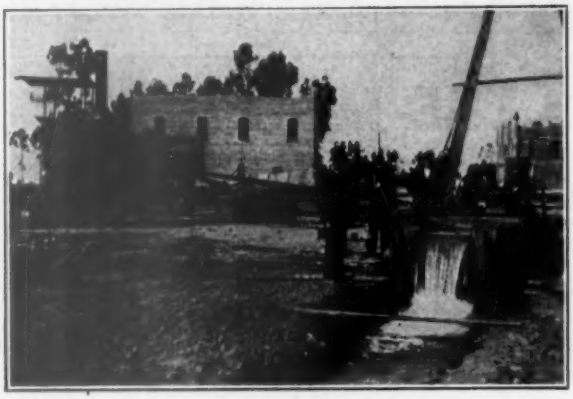
165 Broadway, New York

## WATER AND GAS WORKS MANAGERS

WRITE FOR OUR CATALOG OF

## McWANE PIPE WORKS

LYNCHBURG, VA. NEW YORK CITY.



Pumping 1,100 Gallons of Water Per Minute from a Deep Well for Irrigation in California

## A Sure Water Supply

One of the most important engineering problems of the day is the economical pumping of water and other fluids. Therefore, Compressed Air, on account of its merits, is recognized as a reliable power for pumping, embodying simplicity, economy and durability. A variety of conditions means a demand for a variety of pumping equipment. We have equipment for all conditions.

**Every plant installed under guarantee**
**Write for Catalogue**

## HARRIS AIR PUMP COMPANY

INDIANAPOLIS : IND.

## Horse Drinking Fountain

**STRONG, SUBSTANTIAL, NEAT IN APPEARANCE, MODERATE IN PRICE**

### A HORSE WILL DRINK OUT OF A TUB

and be satisfied—but you do not want tubs on your street corners.

Drinking fountains are a necessity, so why not have one that combines sightliness with usefulness—especially when it costs less than some of the tubs we sometimes see on city streets.

These fountains cannot be displaced or broken by hard usage.

They are graceful in outline, and an ornament to any street.

MANUFACTURED BY

## SUPERIOR IRON WORKS CO., Superior Wis.

## THE GAMEWELL FIRE ALARM TELEGRAPH COMPANY

**MANUFACTURERS AND CONTRACTORS FOR OVER 50 YEARS OF**

## Fire Alarm and Police Signal Telegraphs

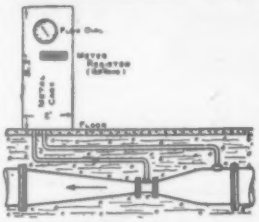
**AND FOR SPECIAL APPARATUS THEREFOR.**

**OVER 1,300** Plants in actual service in the United States and Canada. Plants also established in Cuba, Philippine Islands, South America, Germany, Hawaii, West Indies, England, Norway and South Africa.

JOSEPH W. STOVER, President C. W. CORNELL, Secretary W. W. BOWES, Treasurer
WILLIAM GELLATLY, Gen. Supt.

EXECUTIVE OFFICE **19 BARCLAY STREET, NEW YORK CITY**

# WATER METERS FOR LARGE PIPES



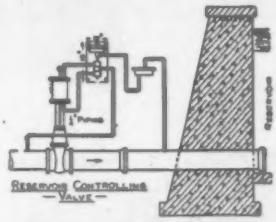
SIMPLEX METER

**Controlling Valves for Reservoirs and Standpipes**

**Automatic Air Valves for Pipe Lines**

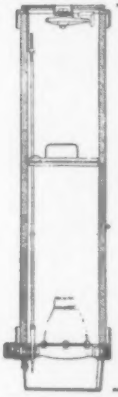
"Those who have tried it know that it pays handsomely to have a station METER on every important pumping main."

**APPLY FOR CATALOGUE**




RESERVOIR CONTROLLING VALVE

**SIMPLEX VALVE & METER COMPANY, 112 North Broad Street, Philadelphia, Pa.**



# A COMPLETE METER BOX

Among the many other points of excellence which the Ford Meter Box enjoys over all other makes is the fact that it is complete in itself. It requires not one cent of expense nor one minute's time to prepare it for its meter. It is adjustable to different makes of meters and is the most thorough protection from surface water, frost and all other damaging influences. It is light, durable and made by an experienced water works man to meet every requirement. Saves money and annoyance.

WRITE FOR DESCRIPTIVE BOOKLET

## FORD METER BOX COMPANY

112 SOUTH HIGH STREET, HARTFORD CITY, IND.

**BUILDERS IRON FOUNDRY, Providence, R. I., Sales Agents for New England**

# INFRINGEMENT NOTICE

THE CLARK METER BOX has met with wonderful success. Is it any wonder that it is imitated? Our boxes are now in use throughout the entire country and they are giving perfect satisfaction everywhere. Thousands in use by THE UNITED STATES GOVERNMENT.

We wish to advise our many friends and patrons that our goods are well protected by patents and institution of legal proceedings have been commenced to protect our rights. All infringing MANUFACTURERS and USERS will be prosecuted to the fullest extent of the law.

Let us tell you about our IRON COLLAPSIBLE FORM for the manufacture of CONCRETE METER BOX Bodies, at one-fourth the cost of any other box body. Our TEKSAGON (No Gasket) Meter Coupling is a wonder. Costs no more than ordinary coupling.

**Drop us a postal card for catalogue.**

**H. W. CLARK CO., 1512 Broadway, Mattoon, Ill.**

# BOXES FOR WATER METERS

We make a complete and finished meter box, including all pipes in place and meter connections, frost-proof, air-tight, water-proof, for $3.00.

Durable—no expense to maintain—easily accessible for reading or removing the meter; protected from interference or injury.

WRITE US

**THE GRAND RAPIDS METER BOX CO.**

574 Wealthy Avenue Grand Rapids, Mich.

ACCURATE AND DURABLE

# WATER METERS

with standard six-hand or straight reading dials, indicating in cubic feet, gallons or liters. Also meters for fuel oil, or other liquids.

## BUFFALO METER CO.

290 Terrace, Buffalo, N. Y.

ESTABLISHED 1892.

# IT WILL LAST LONGER

ODORLESS

SANITARY

Made in sizes from 37 to 65 cubic feet capacity. (Patented.)

**MADE FOR ONE OR FOR TWO HORSES**

Look at the construction of this Wagon. The body is all steel. The dumping devise is solid, strong and simple. The wheels and axles are made especially for hard, constant service, under heavy loads. There are no cracks or sagging doors; it won't leak and it can't dump until you are ready. A perfect combination of the best qualities in a dumper. These Wagons will give satisfaction and save you money.

Our Catalogue "B" gives full information about our sizes and styles.

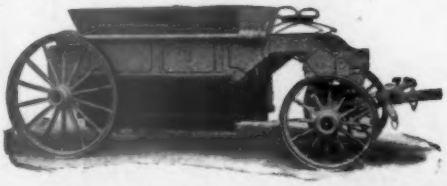
—WRITE FOR IT—

**GEORGE H. HOLZBOG & BRO.,**

**236 East Chestnut Street .·. JEFFERSONVILLE, IND.**

# We Do Not Use Wooden Doors, Because—

the bottom doors of a dump wagon should be durable (for they are subject to very severe usage), as well as absolutely sand tight. Neither of these conditions is fulfilled by wooden doors covered with thin sheet iron or steel. Hence in designing the Troy dump wagon, doors of solid sheet steel (well stiffened) were selected. These doors closed in such a manner that one door laps 2 ins. over the other, **and they never bind or jam in closing**; the lapping of the doors is secured in the simplest, yet most ingenious manner, as explained in the TROY CATALOG No. 2F.



**THE TROY WAGON WORKS CO.** **South Crawford Street, Troy, Ohio**

IF YOU WANT THE

# BEST SYSTEM OF BOOKKEEPING FOR WATER COMPANIES

WRITE TO

**MUNICIPAL ENGINEERING COMPANY**

TO USE IT SAVES AND PAYS

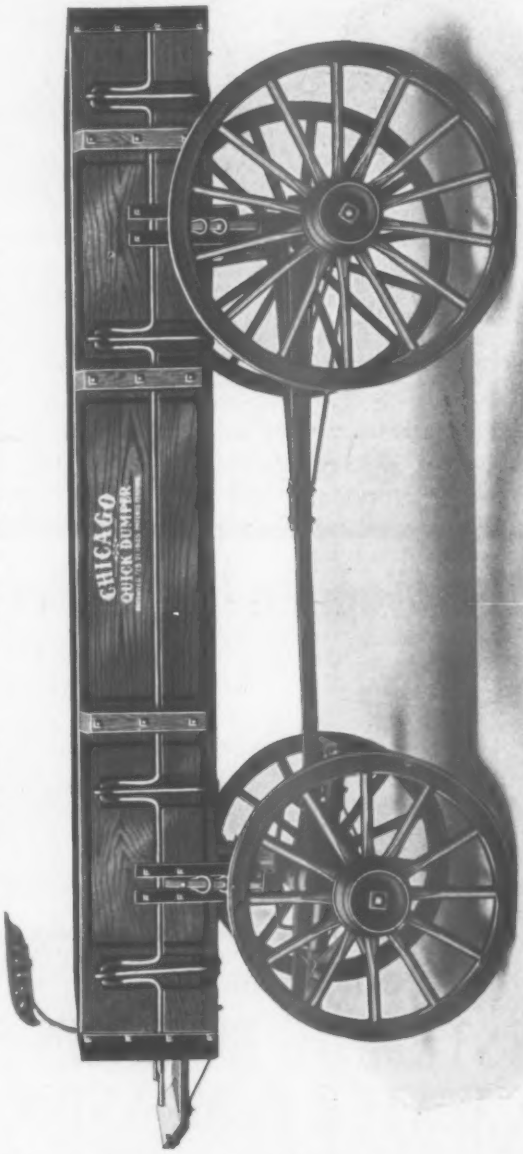
# THE CHICAGO QUICK DUMPER

LOW COST
LIGHT DRAFT

USE OLD GEARS
EASY TO OPERATE

OVER FIVE HUNDRED IN USE IN THE CITY OF CHICAGO.

Operated with two levers—easy reach of driver—no chains or ratchets to break or get out of order.




With one Chicago Quick Dumper and one of your old gears, you have the best dumping outfit ever made at less than one-third the cost of an ordinary dump wagon.

Made in Sizes 1 to 5 yards. Couples up to 65 inches.

Write for Catalog No. 12 **BLACK MFG. CO., Chicago**

# Studebaker Sprinklers

*Are Used*

# Everywhere

The fact that we manufacture more Sprinklers than all other manufacturers combined, and that Studebaker Sprinklers are being used in over 1300 cities, serves to demonstrate the superiority of the Studebaker Sprinklers.

We are always prepared to handle large orders.

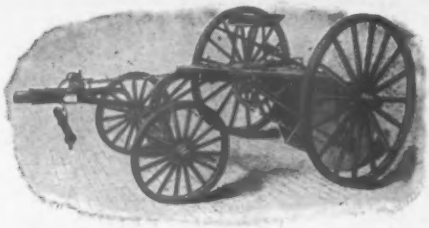
You should know all about Studebaker Sprinklers, Sweepers and Dump Wagons before you place an order. Let us take it up with you in detail.

## Studebaker Bros. Manufacturing Co.

### SOUTH BEND IND., U.S.A.

*BRANCHES*

*New York* *Kansas City* *Salt Lake* *San Francisco*
*Chicago* *Dallas* *Denver* *Portland*



# AUSTIN SPRINKLERS AND STREET SWEEPERS

merit the widespread approval given them:
they are *dependable* in every respect

# YOU WILL FIND

## AUSTIN-WESTERN ROAD MACHINERY

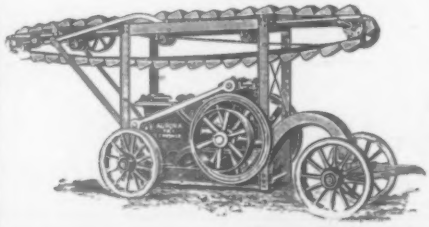
## IN EVERY CORNER

Write for special catalogues

## The Austin-Western Co., Ltd., Chicago, Ill.

THE AURORA JAW CRUSHER HAS FEWER PARTS
than any other crusher of similar capacity, consequently
THE AURORA NEEDS FEWER REPAIRS

**STRENGTH + LIGHTNESS + SIMPLE DUMPING DEVICE =**
**AUSTIN DUMP WAGON**



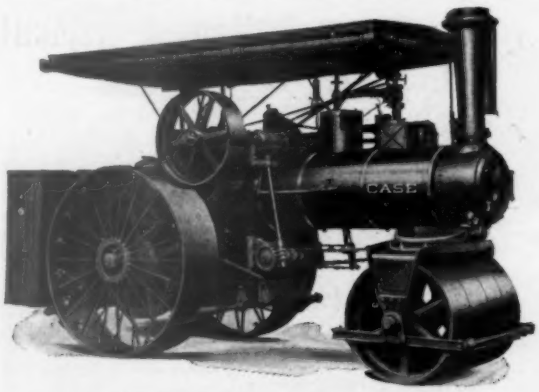
## It Cleans More Pavement Better and Cheaper Than Any Other Method

The Kindling Street Washing Machine. It combines Sprinkler, Sweeper and Flusher

You can scrub your streets with the Kindling Street Washing Machine. It gets all of the dirt all the time. It sprinkles the street and then scrubs it with a rubber squeegee—just like cleaning a window. It raises no dust—it leaves no slippery slime for pedestrians to walk through or horses to slip on—it leaves just a clean, dry, safe pavement. The Kindling Street Washing Machine *costs less* to operate than any other street cleaning machine made.

**Investigate Now and Save the Difference. Catalogue, Testimonials, Prices, Etc., Furnished on Application**

**KINDLING MACHINERY CO. :: Milwaukee, Wis.**




CASE 8¼x10-INCH CYLINDER 10-TON ROAD ROLLER

## ADVANTAGES

Short wheel-base allows short turning.

Stronger traction power—power applied to both drivers when traveling straight or in turning corners Can be used for hauling or pulling stones, stumps, etc., out of streets.

A spring differential that saves the gears.

Tubes can be cleaned with regular flue scraper in ten minutes' time.

Friction Clutch for gradual application of power.

Friction Steering mechanism (patented), that guides more rapidly than by hand and with but little exertion on the part of operator.

Front roll can be turned when machine is standing still.

Convertible into hauling engine, and as such can be used for hauling purposes.

Large and heavy flywheel makes it advantageous for all kinds of stationary work.

**Guaranteed to do All or Anything that can be done by Any Other Make or Design of 10-Ton Road Roller**

**Time Price, 10-Ton, with Simple Cylinder, $2,200; with Compound Cylinder, $2,300**

FREE ON BOARD CARS AT THE FACTORY

Ten per cent. discount for cash. Prices subject to change without notice.

*Send for Road Roller Catalog I*

**Address: STEAM ROAD ROLLER DEPARTMENT**

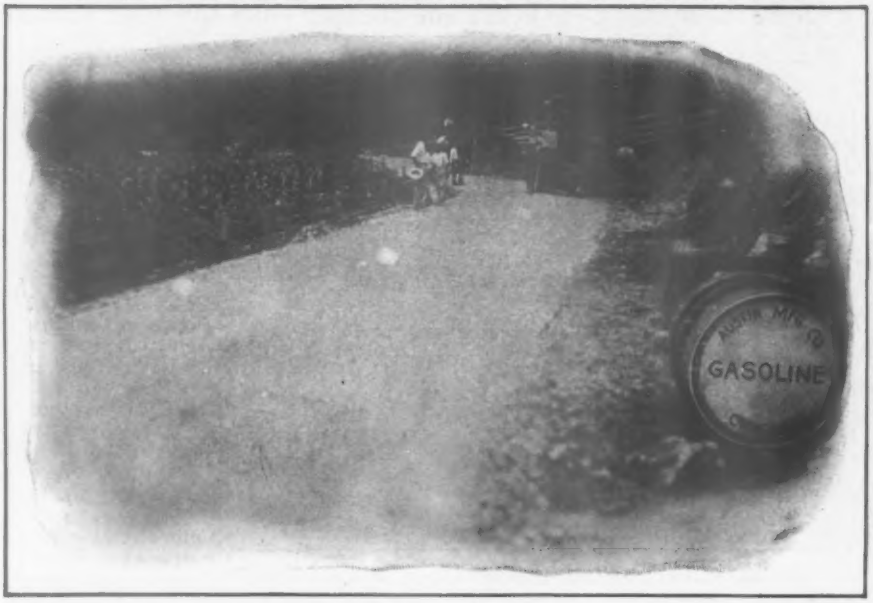
# J. I. CASE THRESHING MACHINE CO.

(INCORPORATED)

## RACINE, WISCONSIN, U. S. A.

## TO BUILD HIGHWAYS WRITE

"THE ONLY WAY"



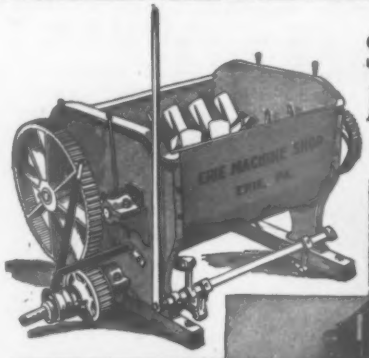

"RIGHT AWAY" TO

## THE AUSTIN WESTERN CO. LTD. CHICAGO

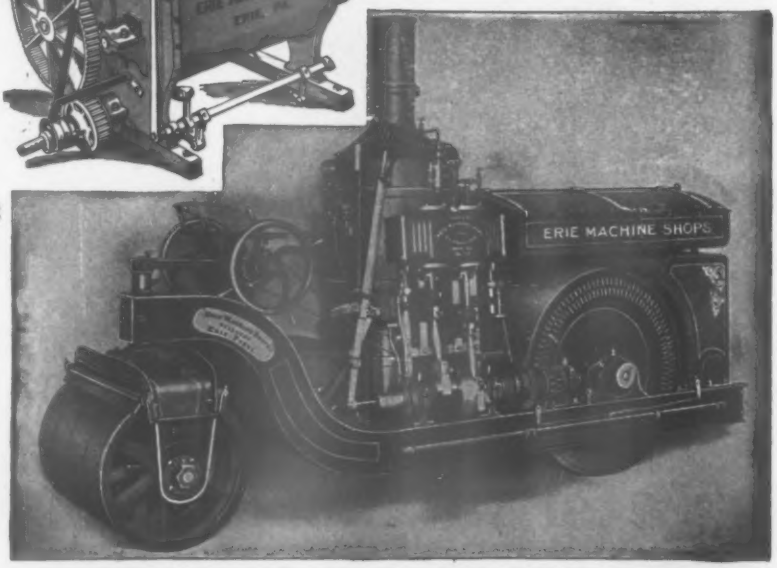
FOR

## THE AMERICAN MOTOR ROAD ROLLER

Steam Rollers & Asphalt Mixers.

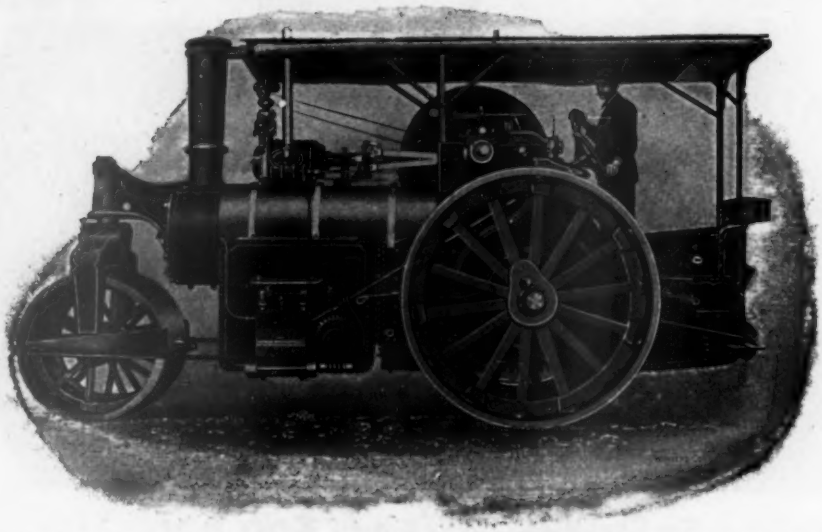


Send for Our Catalogue with Testi-monials




**Erie Machine Shops** { P. W. DIETLY, Proprietor. Cor. 13th and Peach Sts., ERIE, PA.

# THE KELLY-SPRINGFIELD ROAD ROLLER CO.



STEAM ROAD ROLLERS
OVER FIFTEEN HUNDRED IN USE.
SEND FOR HANDSOME CATALOGUE.

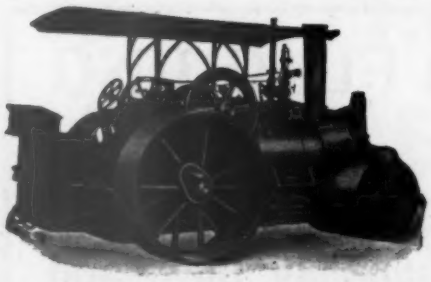
ALL TYPES, ALL SIZES,
SATISFACTION GUARANTEED.

**SPRINGFIELD, OHIO**

PHILADELPHIA OFFICE, 2132 LAND TITLE BUILDING

---

## BUFFALO PITTS

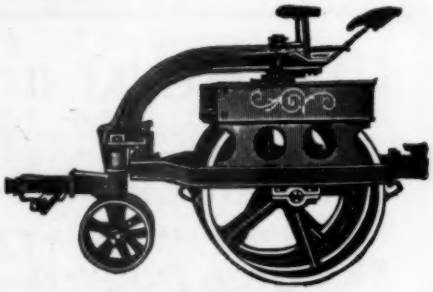


**BUFFALO STEAM ROLLER COMPANY, Buffalo, N.Y.**

Eastern Offices { 15 Court Square, BOSTON, MASS.
150 Nassau Street, NEW YORK CITY

---

## Reversible Road Roller



WRITE FOR CIRCULARS AND PRICES.

**ENTERPRISE MFG. CO.**

COLUMBIANA, OHIO.

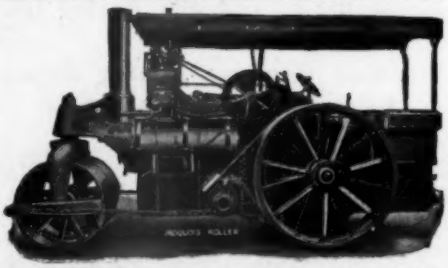
---

## ETNYRE PATENT SPRINKLER

ANY STYLE OR SIZE

Every evolution under instant and absolute control at the driver's seat. Has many superior features.

**E. D. ETNYRE & COMPANY** **OREGON, ILLINOIS**



## IROQUOIS ROLLERS

ALL TYPES
ALL SIZES

**Portable Concrete Mixers, Asphalt Machinery and Tools.** *Send for Catalogue*

**IROQUOIS IRON WORKS Buffalo, N. Y., U. S. A.**

# THE BEST PAVING BLOCK MADE

**Six Factories—Daily Output 500,000**

## THE METROPOLITAN PAVING BRICK CO.

**CANTON, OHIO**

---

## CURBING and FLAGGING

We own and operate the finest and one of the largest SANDSTONE plants in Ohio, and make a specialty of machine dressed (something new) and split curbing and sawed flagging. We also furnish BUILDING STONE and GRINDSTONES in any quantity.

CORRESPONDENCE WITH CITY ENGINEERS ESPECIALLY SOLICITED

**The Ohio Quarries Company, Cleveland**

818 EUCLID AVENUE

---

## Boone Brick, Tile and Paving Co.

MANUFACTURERS OF

**Vitrified Repress Paving Brick**

**Also Farm Drain Tile and Hollow Blocks**

**BOONE, IOWA**

---

R. D. CULVER, Pres. L. A. CULVER, JR., Sec'y & Treas.

## THE WABASH CLAY COMPANY

For 15 years, leaders, in the Middle West, in the manufacture of high-grade paving material; in use in 70 cities and towns within a radius of 200 miles of

**VEEDERSBURG, INDIANA**

where are located their office and works.

---

## THE WASSAL BRICK COMPANY

MANUFACTURERS OF

## VITRIFIED PAVING BLOCK

**GLOUSTER, OHIO**

---

## The Deckman-Duty Brick Co.

**PAVING BRICK AND BLOCK**

Annual Capacity 30,000,000

Plants: Collinwood, O., Carrollton, O., Malvern, O.

**Offices: Electric Building, Cleveland, Ohio**

# The Purington Paving Brick Co.

## OF GALESBURG, ILL.

**Manufacturers of**

# REPRESSED PAVING BRICK AND BLOCKS

**Shipped During the Year 1908**

105,231,000

# Street Paving Brick and Block

**ALSO SIDEWALK BRICK**

**The towns using our material are too numerous to mention here, but we will gladly send a list of them for the asking**

## CLINTON PAVING BRICK COMPANY

CLINTON, INDIANA

---

## SPRINGFIELD PAVING BRICK COMPANY

MANUFACTURERS OF

**VITRIFIED SHALE PAVING AND SEWER BRICK**

**CAPACITY, 75,000 PER DAY** **GOOD STOCK CONSTANTLY ON HAND**

OFFICE AND WORKS: SPRINGFIELD, ILL.

---

## FIGURES NEVER LIE BUT THE SHORTEST WAY TO THE TRUTH IS THE BEST

FOUR days at $1.25 per day equals $5.00—that's easy! But, 17 days in a 31 day month at $1,000 per year? That's different! And 19¼ hours at 37½ cents per hour? Take a pencil and paper—work it out and note how much time, paper and figures you use.

¶ In each instance, with the "*Brain System of Rapid Calculation Tables*," without using pen, pencil or paper, we will give you the answer, absolutely accurate, in two seconds.

¶ To an accountant, bookkeeper, time-keeper or to any one where pay-rolls have to be figured, but one glance at the *Tables* gives any calculation.

¶ How is it done? Send us a Money Order, Express Order or Registered Letter for three dollars, ($3.00) and we will send you the book, charges prepaid, and if it is not all we claim for it, return it to us in two days, and we will refund your money. Address

**C. C. BRAIN CO., Inc. Dept. F. One Broadway, New York City : Agents Wanted**

---

**JOURNAL OF THE ASSOCIATION OF ENGINEERING SOCIETIES**

**MARCH - 1909**

30 CENTS PER COPY
$3.00 PER ANNUM

FRED. BROOKS, Secretary
31 MILK ST., BOSTON, MASS.

**Why Engineers Do Not Take More Part in Government**
J. R. Worcester, G. B. Francis, Dexter Brackett, Morris Knowles, F. W. Hodgdon, W. E. McClintock, Boston Society of Civil Engineers.

**Bridge Designing**
Carl Gayler, Engineers' Club of St. Louis.

**Annual Address**
Archer E. Wheeler, Montana Society of Engineers.

**Annual Address**
C. W. Wood, Louisiana Society of Engineers.

**Sinking Pumps**
Frank S. Mitchell, Engineers' Club of St. Louis.

**1907 Sewerage Statistical Tables**
Sanitary Section Boston Society.

**Discussion on "Pressure Fluctuations in Turbine Pipe Lines."**

# AUTOMATIC BRICK CONVEYOR

"Patent applied for"

We Own It—Device Saves Time and Labor—Delivers Brick Unchipped
Enables Us to Turn Out Good Paving Cheap

BRICK CONVEYOR RENTED TO MUNICIPALITIES OR CONTRACTORS

**Write to Us**

**Carlson & Theselius,** BRICK PAVING CONTRACTORS
912 Granville Ave., Chicago, Ill.

---

## THE BUCKEYE BRICK AND BLOCK CO.

MANUFACTURERS OF

THE FAMOUS "BUCKEYE" PAVING BLOCK

WORKS: ELLIS, OHIO — OFFICE: ZANESVILLE, OHIO

---

## Michigan Paving Brick Co.

VITRIFIED PAVING BRICK AND BLOCKS
SIDEWALK, SEWER, BUILDING AND FOUNDATION BRICK

119 LAPEER STREET — SAGINAW, MICHIGAN

---

M. J. BANNON, Pres. and Gen. Mgr.
P. BANNON, JR., Vice-Pres. and Treas.
L. J. VEENEMAN, Sec.

## Kentucky Vitrified Brick Co.

(INCORPORATED)

Manufacturers of Vitrified Paving Brick for Streets and Roadways

Also All Grades of Fire Brick, Fire Tile, Fire Clay, Etc.

WORKS, MAGNOLIA AVE., 9TH TO 10TH

Office 608-10-12 West Jefferson St. — Louisville, Ky.

---

## THE CLEARFIELD CLAY WORKING COMPANY

MANUFACTURERS OF

VITRIFIED, RE-PRESSED
FIRE CLAY AND SHALE PAVING BRICK
AND BLOCKS

CLEARFIELD, PA.

---

## THE DANVILLE BRICK CO.

*Danville Paving Block*

DANVILLE — ILLINOIS

---

## TERRE HAUTE VITRIFIED BRICK CO.

SUCCESSORS TO
TERRE HAUTE BRICK & PIPE CO.
MANUFACTURERS OF
VITRIFIED BRICK
For Paving, Buildings and Sewers
TERRE HAUTE, IND.

---

## SAGINAW PAVING BRICK COMPANY

MANUFACTURERS OF
VITRIFIED PAVING BRICK AND BLOCKS
Also Sidewalks and Face Building Brick Manufactured from Fire Clay and Shales
Office and Works, Cor. of Jefferson and Sidney Sts.
SAGINAW, MICHIGAN

---

INDIANA PAVING BRICK AND BLOCK CO.
Manufacturers of
Street Paving Bricks and Blocks
Office: 601
Traction and Terminal Bldg.
Indianapolis, Ind.

# National Paving Brick Manufacturers' Association

**WHAT TAX PAYERS WANT:**
A street that will not require constant repair.

**WHAT ROAD USERS WANT:**
A street that is a comfort to travel over.

**WHAT THE PUBLIC WANTS:**
A SANITARY CONDITION of highways.

These demands are fully met by a strict compliance with all the details of construction as laid down in the directions for the construction of Brick Street Pavements, as promulgated by the National Paving Brick Manufacturers' Association.
Send for the DIRECTIONS.
The construction of Country Highways must undergo a revolution.
Send for "THE PERMANENT ROADWAY."

WILL P. BLAIR, Secretary
521-523 Board of Trade Building, Indianapolis, Indiana

# F. B. HOLMES & COMPANY

MANUFACTURERS AND SHIPPERS OF
FIRE BRICK, FIRE CLAY, TILE, PORTLAND CEMENT, AND SPECIAL SHAPES SEWER PIPE, BUILDING AND PAVING BRICK
Offices: 304-309 Hammond Building, Detroit, Mich.

# THE PEEBLES PAVING BRICK CO.

Manufacturers of
PEEBLES BLOCK
Two Plants. Daily Capacity, 100,000. PORTSMOUTH, OHIO

# THE CARLYLE PAVING BRICK CO.

Portsmouth, Ohio
HIGH-GRADE PAVING BRICK MADE FROM THE FAMOUS SCIOTO SHALES

## THOMAS MOULDING COMPANY

Manufacturers and Dealers
PAVING BRICK
Face Brick Fire Brick Tiffany Enameled Brick
1202 Chamber of Commerce : Chicago

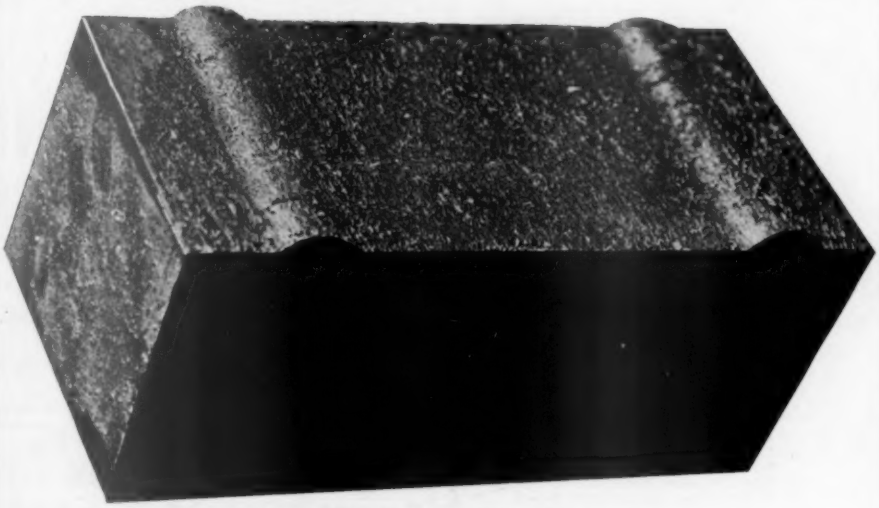
## Sewage Disposal Without Sewers

**The Ashley System** is peculiarly adapted to the use of Homes **outside the sewer district.** Hundreds of plants in successful operation. *Free Illustrated Booklet*

ASHLEY HOUSE-SEWAGE DISPOSAL CO.
6507 Normal Blvd. : Chicago

# For Better Brick Pavements

## Dunn's Wire Cut Lug Brick Furnishes Just What Is Needed For A Perfect Brick Pavement



Dunn's Wire Cut Lug Brick (Patented)

## SOME OF ITS ADVANTAGES

Keeps all bricks a uniform distance apart
Admits free flow of filler and makes perfect bond
Lugs can be cut any angle desired
All bricks have square edges and corners
Greater density than repressed brick
Greatly reduces the percentage of culls and seconds

Regarded by all engineers who have seen it as the most advanced step in paving brick manufacture in years. It possesses all the advantages of repressed brick and none of the disadvantages.

City Officials, Engineers and Contractors are asked to investigate because this brick means

**BETTER BRICK PAVEMENTS**

## FRANK B. DUNN, Conneaut, Ohio

# "ACME"
## Corrugated Metal Culverts

(Nestable-Patented)

24-inch 15-gauge "Acme" Culvert under the Twin City & Lake Superior Railway in Carlton County, Minn.

**Cheaper than cast-iron and as good.**

**Stronger than tile or terra-cotta and many years longer lasting.**

**Made of No-Co-Ro Metal and guaranteed to resist the elements of rust for 25 years.**

**We have a flattering trade from traction and steam railways as well as from contractors and highway officials throughout the country, which trade has found "Acme" Culverts satisfactory where the same could not be said so generally of any other corrugated culvert.**

**New illustrated Booklet "M-2" and prices on application.**

**"No-Co-Ro Metal" Booklet C-2, reviewing the superiority of No-Co-Ro over Steel and giving scientific causes for corrosion, on request.**

Installing a 60-inch 168-ft. "Acme" Corrugated Metal Culvert

**THE**

**CANTON CULVERT COMPANY**

... Sole Manufacturers ...

**CANTON, OHIO .... U. S. A.**

# THE CLEVELAND STONE COMPANY

Sole Producer of the Celebrated

**BEREA SANDSTONE CURBING**

And of

# GRAY "CANYON"

**SANDSTONE**

**THE FINEST**

# BUILDING STONE IN THE WORLD

Capacity Over 200 Cars Per Day

**Western Offices**

**447-8 MARQUETTE BUILDING, CHICAGO, ILL.**

**Main Office, CLEVELAND, O.**

**Correspondence Solicited**

---

## J. E. Salfisberg & Co.

116 Fox Street, AURORA, ILL.

**Cement Walks and Brick Paving**

**And All Kinds of**

**Concrete Construction**

---

CHAS. W. SCHAEFFER GEO. H. GENGNAGEL

## SCHAEFFER & GENGNAGEL

JOBBERS AND RETAILERS OF

**Coal, Sewer Pipe, Building Material**

***Portland and Hydraulic Cement***

**Phone 33** 812 to 828 E. First St., DAYTON, O.

---

## The Sanitary Sewer Construction Co.

JACKSON, MICHIGAN

Makers of **CONCRETE SEWERS**

With or Without Reinforcement Over Monolithic Forms

---

## Ask Us Questions

Every subscriber to Municipal Engineering is invited to use our question department. We give you the benefit of the most authoritative information obtainable.

CREOSOTED WOOD BLOCK } { PAVING AND CURBING } { KETTLE RIVER SANDSTONE

**KETTLE RIVER QUARRIES CO.**

**MINNEAPOLIS, MINNESOTA**

---

**SUN COMPANY**

PHILADELPHIA, PENNSYLVANIA

MANUFACTURERS OF **HYDROLENE B**

---

**The J. E. CONLEY CO.**

GENERAL CONTRACTORS

Street Paving, Concrete Construction, Cement Walks, Combined Curb and Gutter.

Office, Yards and Stables, Cor. Ludlow and Bayard Sts. DAYTON, O.

---

**The Western Construction Co.**

CONTRACTORS FOR

**Bitulithic and Asphalt Pavements**

LAFAYETTE, INDIANA

---

**CONCRETE-STEEL ARCH BRIDGES**

EQUAL TO STONE AT THE COST OF STEEL

MELAN, THACHER, EMPERGER AND OTHER PATENTS

**Concrete-Steel Engineering Co.**

Park Row Building, New York, N. Y.

WILLIAM MUESER, C. E. EDWIN THACHER, C. E.

---

Office, 721 Wainwright Bldg. Telephones, Bell Main 35, Kinloch A. 270

**GILSONITE CONSTRUCTION Co**

Asphalt, Cement and Granitoid Work

Brewery Work a Specialty. Asphalt and Tile Roofs Concrete Foundations

Hollow Tile and Concrete FIREPROOFING

St. Louis, Mo.

---

H. P. STREICHER & CO.

**GENERAL CONTRACTORS**

20 ST. CLAIR BLDG. TOLEDO, O

---

**ST. LOUIS CRUSHED QUARTZ CO.**

Dealers in Crushed Quartz for Granitoid and Concreting Siftings for Art Stone. We are turning out High-Grade Quartz Screenings used exclusively for Top Finish of

**Sidewalks and Combined Curb and Gutter**

Office, 416 Roe Building, St. Louis, Mo.

---

**PEOPLE'S COAL AND CEMENT CO.**

**High Grade Portland Cement**

Phones: New 4510; Main 1892 INDIANAPOLIS, IND.

---

**CENTRAL PAVING COMPANY, Inc.**

General Contractors of Paving and Concrete Construction. . . .

92 La Salle Street CHICAGO, ILL.

---

**GRANITE CITY LIME AND CEMENT CO.**

CEMENT, MACADAM, SAND

GRANITE CITY, ILL.

---

Office Phones: New 535; Old, Main 535. Res. Phone, New 3770

**GEORGE. W. FIFE, Contractor**

CONCRETE AND STONE WORK, PILE DRIVING

Concrete and Stone Bridges a Specialty

Office: Builders' Exchange 230 E. Ohio Street INDIANAPOLIS

---

**C. W. CLARK & CO.** General Contractor, making a specialty of all kinds of Cement Work, aims to do the best of work at as low a price as good work can be done for, and Guarantees Satisfaction.

110 Adrian Street, Wausau, Wis.

---

**W. H. Hill Construction Co.**

**STREET AND SEWER WORK**

101 So. 6th St., EAST ST. LOUIS, ILL.

---

WM. J. ERLER

**GENERAL CONTRACTOR**

Creosoted Block and Brick Paving, Concrete Construction, Cement Walks, Excavating and Sewer Work

TERRE HAUTE, IND.

# ALSEN CEMENT 45 Broadway New York City

**Alsen's has positively the best and most uniform color from an artistic viewpoint. Alsen's stands more abuse than other brands, and increases steadily in practical work year after year. This has been proven under the *barying conditions sure* to be met in *large contracts*—very different from laboratory results. Alsen's combines advantages found in no other brand—that is why it is shipped all over the world. We can make attractive quotations on either American or German, by water or rail, to anywhere, in any package.**

**Fifty Years Experience Better Than Assertions.** SEE PAGE 132 IN "SWEETS" FOR FULL PARTICULARS

P&O **GRADING PLOWS** Can be used with six or eight horses without straining it. Beam and handles are heavily strapped with steel. Extra thick mold and share. Extremely heavy and substantial, and built for use in hard clay, shale, and also for tearing up hard roads. Strongest plow made for any purpose. Two sizes, 10 and 12 inch. Mold has a moderate turn, designed to loosen the soil rather than to turn over the furrow, thus preparing the ground for the road scraper. Furnished with Standing Cutter and Gauge Shoe. There is no better Grading Plow made. Write for prices.

**ROAD PLOWS** An unusually heavy and strong Road Plow, which can be worked at a depth of from 6 to 12 inches. Does not turn over the furrow; merely loosens the soil. Beam strapped with steel. Two sizes, 10 and 12 inch. Furnished with Quincy Cutter.

We solicit correspondence from Road Contractors and Commissioners. Largest line of Plows made.

**Parlin & Orendorff Co., Canton, Illinois.**

P. & O. Grading Plow.

# SEVENTY YEARS GOOD

**UTICA CEMENT IS BEING USED TODAY**
**ON THE FOLLOWING IMPORTANT SEWER WORK**

South Kedzie Avenue, the sanitary district canal to 71st Street, 21,720 feet, six to nine feet diameter. Addison Street, Chicago River to Byron Street, 8,095 feet, two to six feet diameter. Sewer system, Morgan Park, Ill. Five and one-half foot sewer in Montrose Avenue, Chicago. Western Avenue sewer, four to twelve foot, about 20,000 bbls. Six foot sewer, East Chicago, Ind., 10,000 bbls., etc.,

## UTICA HYDRAULIC CEMENT

has been used in sewers since 1838. It is still there and it is still GOOD.

The city of Chicago has more than a THOUSAND MILES of Utica Cement Sewers and *still building them.*

Can as much be said for any other cement?

UTICA has proven itself best for sewers. Why take any chances with other brands.

**UTICA HYDRAULIC CEMENT CO., Utica, Illinois**

## WHAT DO YOU WANT ?

**Are you seeking Employment**

**Have you second-hand Machinery for Sale**

**Do you want Machinery or Supplies**

**Do you want men for Employment**

A "Want" advertisement in MUNICIPAL ENGINEERING will be the most thorough, the least expensive and the surest way of finding the opportunity you seek. Rate 1½ cents per word each insertion; minimum charge, 50 cents.


FOR SALE—Street Sweepers for sale, twenty machines of various makes in No. 1 condition. A. H. Greeley, 1111 Superior Viaduct, Cleveland, Ohio.

FOR SALE—Concrete mixers; all standard makes; all sizes; new and second-hand. Write for our catalog of mixers, block machines, molds and tools. United Cement Machinery Manufacturing Company, Plain City, Ohio.

FOR SALE—A thoroughly equipped plant for the manufacture of Illuminating Gas, capable of producing 35,000 to 40,000 cubic feet per day, from good Westmoreland gas coal. Will be sold cheap. Address, Bethlehem Steel Co., South Bethlehem, Pa.

FOR SALE—One Allis-Chalmers Portable No. 1, Style D, Gates Crusher, with 25 h. p. Fairbanks & Morse gasoline engine, all belting, shafting, pulleys, circulating tanks, pipe fittings; painted and erected on forty-thousand-pound flat car. Present location, Leesport, Pa. For further information address Commonwealth Roofing Co., 17 Battery Place, New York, or Warren-Ehret Co., Land Title Building, Philadelphia.

NOTICE—The city of New Albany is proposing to let a contract for electric lighting of said city and one for furnishing gas between now and September 1, 1909, together with necessary franchises for the same. We invite correspondence relative thereto. Address the Mayor or City Attorney, New Albany, Ind.

WANTED—Second-hand, seven-ton steam Roller, Kelly-Springfield or Iroquois preferred. Also Foote concrete mixer or any other standard make continuous mixer. Parties with worn-out machines need not answer. Granite City Lime & Cement Co., Granite City, Ill.

WANTED—Parties to finance and build about four miles of sewers, Standard vitrified sewer pipe to be used, sizes 6-in. to 15-in. or 18-in. Town has a good water works. Apply to J. Allen Butler, Portland, Conn.

WANTED—A first-class Asphalt Plant man who has had large experience. Trinidad Asphalt Mfg. Co., St. Louis, Mo.

NOTICE TO CONTRACTORS—Proposals for construction of a sanitary trunk sewer system. Estimated cost, $64,000.

Notice is hereby given by the Common Council of the City of Shelbyville, Indiana, that sealed proposals will be received by it, at the office of City Clerk, until the hour of six o'clock P. M., on Tuesday, July 20, 1909, for the construction of a sanitary trunk sewer system.

All work done in the making of said described public improvement shall be in accordance with the terms and conditions of the Improvement Resolution as numbered, and the detail plans, profiles, drawings and specifications which are on file and may be seen in the office of the City Civil Engineer and Clerk of the City of Shelbyville.

Each bidder, in submitting proposal to make said described public improvements, must accompany each bid with a certified check or bid bond for an amount not less than two and one-half (2½) per cent. of the Engineer's estimate of the cost of such work bid upon, as evidence of good faith that the successful bidder will execute within five days from the acceptance of proposal, contract and bond satisfactory to the said Common Council to do the work of making said improvements. Said check or bond to be certified by a reputable bank or issued by a reputable surety company doing business in the State of Indiana. A failure of the successful bidder to enter such contract and bond upon the acceptance of such proposal will forfeit the check or bond and the sum of money payable thereon to the city as ascertained and liquidated damages for such failure.

The proposals must be made on certain blanks, which can be obtained from the City Clerk's office.

An approximate statement of quantities and further information can be obtained from the "Information and Instruction to Bidders" sheet which will form a part of the contract, and can be obtained upon request from the City Clerk's office.

HARRY J. CLARK, City Clerk.


**If You Wish to Know** EVERYTHING THAT IS BEING WRITTEN, OR HAS BEEN WRITTEN, REGARDING ANY SPECIAL SUBJECT IN WHICH YOU ARE INTERESTED

**If You Wish to Know** OF A SIMPLE AND PRACTICAL WAY OF KEEPING IN TOUCH WITH THE PROGRESS OF YOUR PROFESSION AT HOME AND ABROAD

**Consult**

## THE TECHNICAL INDEX,

**A monthly review of current technical literature.**

Subscription, $2.50 Yearly.
Sample Copy, .25.

Every development in every branch of Municipal Engineering is recorded and may be traced by "The Technical Index."

**Published by M. J. FITZ-PATRICK,**
**51 rue de l'Aurore, - - - BRUSSELS.**

# SQUARE LUG BAR

**Mild Bessemer Steel Bars Carried in Stock**

SIZES: $\frac{1}{4}''$, $\frac{3}{8}''$, $\frac{1}{2}''$, $\frac{5}{8}''$, $\frac{3}{4}''$, $\frac{7}{8}''$, $1''$, $1\frac{1}{8}''$, $1\frac{1}{4}''$

Weight and sectional area same as square bar

**Ample Stocks in all Sizes** **Get Our Quotations**

High Carbon or Mild Steel

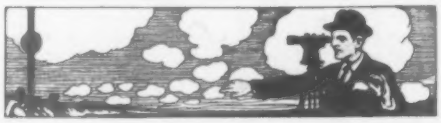
We are also large manufacturers of Expanded Metal

**THE GENERAL FIREPROOFING CO.**

**Youngstown, Ohio**

Catalog M. 105 contains useful tables of design

Open Hearth or Bessemer Process



INSTRUMENTS made under the supervision of our associate, Mr. George N. Saegmuller, and bearing our trade-mark represent the highest refinement in mechanical construction and optical arrangement. The beauty of design and symmetry that characterize every instrument are an expression of the enthusiam which we put into our work.

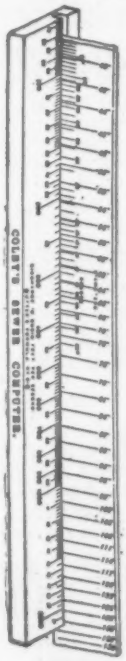
Our complete Engineering Catalog will be sent free on request.

*Our Name on a Photographic Lens, Microscope, Field Glass, Laboratory Apparatus, Engineering or any other Scientific Instrument is our Guarantee.*

**Bausch & Lomb Optical Co.**

NEW YORK WASHINGTON CHICAGO SAN FRANCISCO
LONDON ROCHESTER, N.Y. FRANKFORT

EVERY CITY ENGINEER OUGHT TO HAVE



# COLBY'S Sewer Computer

**IT SAVES LABOR**

**IT SAVES MANY TIMES ITS COST**

## WHAT IT IS

This instrument is Kutter's formula in the form of a slide rule. The values obtained are the same as given by Kutter's formula; the value of the coefficient "N" being taken at .013. The cut shows only a portion of the entire computer. The divisions on the limb represent discharge in cubic feet per second. On the slide are two scales, the divisions of one indicate different diameters of sewers in inches; the divisions of the other represent the per cent. of grade. The computer can be used by any one after one minute's explanation.

Colby's Sewer Computer gives correct results according to Kutter's formula. It is accurate and perfect in every respect. It is 21 inches long and weighs a few ounces. Full directions with each computer.

**Price, in Handsome Case, $10.00**

**RETURN IT IF NOT SATISFACTORY**

Any city engineer purchasing one of these computers from us may return it if it is not found to be satisfactory; we will pay the charges both ways and refund the money paid for it.

**This is an Indispensable Article in the Equipment of Every City Engineer's Office**

SEND ORDERS AND REMITTANCES TO

**MUNICIPAL ENGINEERING COMPANY**

INDIANAPOLIS, IND.

# THE CONTINUED TRIUMPH
## of the
# Patented Bitulithic Pavement

SINCE the decision of the Supreme Court of the United States, on May 24, 1909, refusing the writ of Certiorari in the Owosso case, thereby confirming the decision of the Circuit Court of Appeals as rendered by Judge Lurton, the Legislature of the State of Wisconsin has passed two bills, the first applicable to cities of the First Class, including the city of Milwaukee, the other to cities of the Second, Third and Fourth Classes, providing for the use of patented pavements when placed in competition with other kinds of pavements answering the same general purpose. It will be remembered that the Supreme Court of the State of Wisconsin was the first to lay down the rule, in 1868, in the case of Dean vs. Charlton, 23 Wis. 590, that the adoption of specifications which required the use of a patented pavement prevented competitive bidding and was, therefore, illegal, where competitive bidding was required; and while this court has consistently adhered to this rule, notwithstanding its hardship upon cities desiring to keep abreast of the times, and avail themselves, as individuals do, of the very latest and best improvements, whether patented or not, the Legislature of the State has come to the rescue of its cities and passed the legislation above referred to, permitting the purchase of patented articles and the laying of patented pavements if placed in competition with other patented or non-patented articles answering the same general purpose.

In the city of Portland, Oregon, under the initiative provision of the city charter, our competitors succeeded in getting the requisite number of signatures to a petition submitting to a popular vote an amendment to the city charter as follows:

> "Prohibiting the use of any patented article or any article or process protected by patent or trade-mark, or any article or process wholly controlled by any person, firm or corporation, or any combination thereof, in the improvement of any street, highway or public place in the City of Portland."

This proposed amendment was voted on by the citizens of Portland on June 6, 1909, and was defeated by a vote of about four to one, showing a very strong sentiment of the taxpayers of Portland in favor of Bitulithic pavement, which has been in use in that city for six years, the area of Bitulithic pavement now in use and under contract for construction in the city of Portland, Oregon, being 509,741 square yards.

In other States where the Wisconsin rule was even partially followed, the courts have already modified their holdings to such an extent that practically all cities are now permitted to advertise for and receive bids upon patented articles, including street pavements, when placed in competition with other articles or pavements of the same general character.

## The Advantages of the Bitulithic Pavement

over all other kinds of monolithic street pavements have become so firmly estab ished in the public mind that neither courts nor Legislatures could longer resist the public demand for its adoption, notwithstanding the patents which cover its construction.

In view of the unparalleled development of the Bitulithic pavement, from 16,400 square yards laid in 1901 to 1,676,442 square yards in 1908, with 1,332,037 already laid and under contract for the year 1909, it is no wonder that other contractors should now attempt to imitate the construction covered by the Bitulithic patents and seek to avail themselves of the advantages of the business which has been built up under them.

The action of the Legislatures, the decisions of the courts and the frantic efforts of imitators to lay something claimed to be "just as good" at an impossible price, all testify to the superior qualities of the Bitulithic pavement, the public demand for its adoption, and its general recognition as the best known modern construction to meet the demands of the public for a sanitary pavement, free from dust and noise and capable of withstanding the disintegrating effects of automobile and other traffic.

**Send for Literature. Yours for the asking**

---

# Warren Brothers Company

**59 Temple Place**
**BOSTON, MASS.**

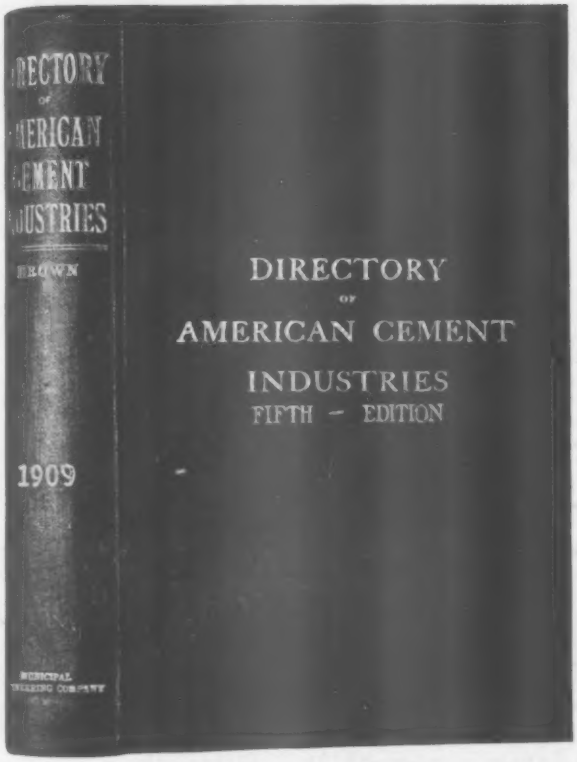
**REGISTERED TRADE-MARKS**

**"Bitulithic" "Bitrock" "Puritan" "Bitustone" "Bituminous Macadam"**

## New Edition (5th) *of*

# The Directory of American Cement Industries

(Completely Revised)




## What It Contains

The names, credit ratings and estimates of quantities of cement used and handled by:

25,000 Contractors and Users of Cement.
15,000 Dealers in Cement.
7,000 Engineers and Supervisers.
6,000 Companies Furnishing Machinery, Tools and Supplies.
300 Testing Laboratories.

Complete list of cement plants now operating, with full list of officials, and output, capitalization, brands, process and machinery.

Also all companies organized and plants under construction.

Complete list of brands of Portland and natural, domestic and foreign cements in the American market.

Complete list of sales agents and the brands they handle.

Complete alphabetical list of cement companies.

Complete list of makers of cement blocks, bricks, tiles and other cement products.

Manufacturers of reinforcing materials, concrete mixers, etc.

Names of all who order a copy within the next few weeks will appear in bold faced type under all classifications desired.

Will be off of presses in a few weeks.

**Price $5.00 on delivery of book**

**MUNICIPAL ENGINEERING CO. : Indianapolis**

# WAINWRIGHT GALVANIZED STEEL CORNER BAR

**For Protecting Edges of Concrete Curbs, Steps, Columns, Etc.**

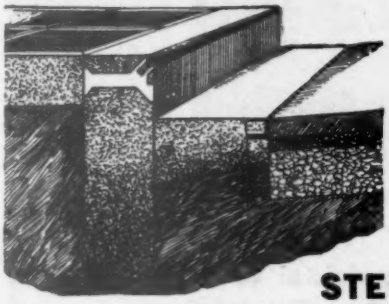
The only effective **CONCRETE EDGE PROTECTOR** offered to the contracting public

WAINWRIGHT PATENTS—March 9, 1897. November 22, 1898. May 5, 1903. March 26, 1907. August 29, 1907.

This bar is well galvanized so it will not rust. Has a **solid head**, guaranteeing resistance from the heaviest possible impact of wheels or other heavy bodies, and is held in place by a **dove-tailed web** forming an anchorage extending its full length, not only anchoring but supporting the **solid head** every inch of its length.

This bar has been in public use for more than ten years as the main feature of the

# WAINWRIGHT STEEL-BOUND CONCRETE CURB



**THE BEST IN THE WORLD**

## OVER TWO MILLION FEET

**In use in more than one hundred and fifty cities in the United States.**

The **dove-tailed web** anchors the bar at all points, resulting in great superiority over a corner protector anchored by bolts, wires or rods at intervals, allowing buckling or expansion, causing ultimate loosening of the metal from the concrete.

**METAL PARTS FOR SALE**

**SEND FOR COPYRIGHTED BOOKLET, No. 3**

## STEEL PROTECTED CONCRETE CO.

**Real Estate Trust Building, PHILADELPHIA, PA.**

---

**The Polygon Mixer Means**

## EFFICIENCY, CONVENIENCE, SIMPLICITY, DURABILITY and ECONOMY

**Better Concrete at a Lower Cost**

If you mix Concrete you should know the Polygon Mixer. To know it is to use it.

Write for Booklet No. 8

## Waterloo Cement Machinery Corporation,

**WATERLOO, IOWA**

**Manufacturers of THE GREAT POLYGON LINE of Contractors' EQUIPMENT and SUPPLIES**

---

# *The* BURNESS CONCRETE TRUCK Patented

**is just what is wanted for**

## SLOPPY CONCRETE or MIXED CEMENT

It has lip turned down on the top edge to keep any splash getting over the edge, and being evenly balanced two men can handle one half yard with ease on a level run.

It also has a ring attached underneath to pull up grade when needed, and besides being a great money saver one can do a great deal better work and have better satisfaction every way.

I have not used a wheelbarrow on concrete for two years and when running full force, I count a saving of $25.00 a day.

*For particulars enquire of*

## F. B. BURNESS, Scarritt Bldg., Kansas City, Mo.

THE BEST IS THE CHEAPEST

PENINSULAR PORTLAND CEMENT JACKSON MICH

TRADE MARK.

PENINSULAR PORTLAND CEMENT CO.

GENERAL OFFICE, JACKSON, MICH.

COWHAM SYSTEM

**New Automatic Cement Tester**

Gold Medal
Jamestown Tercentennial
Exposition, 1907

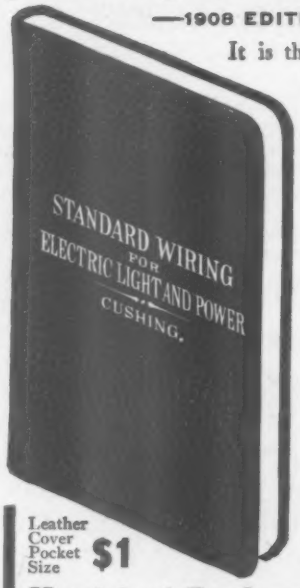
**Tinius Olsen & Company**

500 North 12th Street
Philadelphia, Pa.

Manufacturers Cement and Concrete Testing Machines and all Auxiliary Laboratory Apparatus

**"The Recognized Authority on Wiring and Construction"**

—1908 EDITION—




It is the only book on electric light and power wiring kept strictly up to date. It contains every rule, table and formula for every class of wiring. It settles disputes, and, if referred to before wiring, prevents disputes.

Leather Cover Pocket Size **$1**

**Municipal Engineering Co.**
Indianapolis, Ind.

**SUNFLOWER BRAND**

**PORTLAND CEMENT**

Always a favorite with the trade. Never a barrel rejected.
Capacity 8,500 barrels per day.

**UNITED KANSAS PORTLAND CEMENT COMPANY**

811 COMMERCE BLDG., KANSAS CITY, MO.

CHICAGO PORTLAND CEMENT COMPANY — CHICAGO PORTLAND CEMENT — CHICAGO ILL.

**"CHICAGO AA" 1,000,000 Barrels Annually**

**HIGHEST QUALITY**

The Best That Can Be Made

**CHICAGO PORTLAND CEMENT CO., 108 La Salle St., Chicago, Ill.**

**33% Saved by Using Our Brick Clamp**

Write DUPLEX MANUFACTURING & FDRY. CO.
New England Bldg., Cleveland, Ohio

MANHOLES, CATCH BASIN COVERS, MONUMENT COVERS—A FULL LINE

# LEHIGH PORTLAND CEMENT

GUARANTEED FOR UNIFORMITY, STRENGTH AND DURABILITY

RECOMMENDED FOR HIGH-CLASS ENGINEERING WORK

MANUFACTURED BY

## LEHIGH PORTLAND CEMENT CO.

ALLENTOWN, PENNSYLVANIA

Western Office, 725 ROCKEFELLER BUILDING, CLEVELAND, OHIO

WRITE FOR PRICES. CATALOGUES, TESTS, ETC., MAILED ON APPLICATION

## Accurate, Automatic, Convenient Continuous, Durable, Reliable

and a Great Saver of Money and Muscle is the

## U. S. STANDARD CONCRETE MIXER

The best of its kind for the medium-size operator. For bridges, abuttments, culverts, retaining walls, basements, foundations, sidewalks, block factories, etc., it has no equal. Built with either two or three hoppers. Mechanical principles essentially new and patented.

## The U. S. Standard Cement Block Machine

is a fit companion to the U. S. STANDARD Concrete Mixer. It would be impossible, here, even to outline the many superior points in which this block machine excels all others. If you want a dinkey, don't waste any postage on us. If you want a complete machine, one which includes in its equipment circular work, angle blocks of any desired angles, porch piers 12 to 24 inches square, chimney blocks 16 to 24 inches square, water tables, regular hollow blocks 6, 8, 10 and 12 inches thick; veneer blocks 3, 4, 5 or 6 inches thick, all of these in rock or bevel face, 4 and 8 inches high and any length up to 24 inches, etc., etc.. etc., drop us a line and we will acquaint you with the most complete machine you ever saw. Write for our catalogue.

MANUFACTURED BY

## THE ASHLAND STEEL RANGE AND MANUFACTURING COMPANY

ASHLAND, OHIO, U. S. A.

Government Foreign Sales Department, B 21 PRODUCE EXCHANGE, N. Y.

# BLANC STAINLESS CEMENT

**A true Portland Cement, WHITE in color**

---

## Meacham & Wright Company

**Distributors for Illinois** CHICAGO



# Universal Portland Cement

is thoroughly uniform in color and strength, perfectly sound, absolutely regular in setting qualities and every barrel conforms rigidly to Standard and Government specifications. The location of the plants with reference to transportation facilities, combined with a daily output of 17,000 barrels, now being increased to 23,000 barrels per day, insures the most satisfactory service in the matter of prompt shipments.

A Standard Portland for Universal Use

Daily Output 17,000 Barrels, increasing to 23,000 Barrels. Plants at Chicago & Pittsburg

## UNIVERSAL PORTLAND CEMENT CO.

CHICAGO—PITTSBURG

# ARE YOU GOING TO BUILD?

No matter what kind of a structure you contemplate building, it will pay you to post yourself on the advantages of concrete construction made with

## Atlas Portland Cement

*Daily Capacity Over 40,000 Barrels*

Reinforced Concrete Carpenter Shop, National Cash Register Company, Dayton, O.

A concrete building means protection from fire, vermin and decay. It is cool in summer and warm in winter; requires no paint or repairs, yet permits of pleasing architectural effects and color schemes. In most cases you will find concrete construction the least expensive in the beginning and in all cases the cheapest in the end.

The success of concrete construction depends largely on the quality of cement used. **ATLAS** is the highest grade of Portland cement manufactured.

This Company makes but one quality—the same for everybody.

Tell your architect to specify **ATLAS.** Ask your dealer for it. You will know it by the Trade-Mark.

Building Books **FREE** on request.

As a guide to prospective builders we have published the following books which will be sent **FREE** on receipt of postage.

Concrete Construction about the Home and on the Farm—*Postage 4 cents*
Reinforced Concrete in Factory Construction—*Postage 10 cents*
Concrete Country Residences—*Postage 25 cents*
Concrete Cottages—*Postage 1 cent*

## The Atlas Portland Cement Co.

Dept. N **30 Broad Street, New York**

# ALPHA PORTLAND

On the market for the past sixteen years. One brand only manufactured —a strictly straight Portland—which in uniformity and general excellence can not be equalled.

THE RECOGNIZED STANDARD AMERICAN BRAND

ALPHA PORTLAND CEMENT CO.

GENERAL OFFICE
EASTON, PA.

# 920-Foot Bridge Built in 23 Days

A Concrete Arch Bridge, 920 feet long and 50 feet wide, was built complete in 23 working days at McCall Ferry, Pa., to serve as a construction bridge for building a dam. The work was done in single shifts of 11 hours each, and one arch was placed per day. The bridge carries four standard gauge tracks for 50-ton cars and one straddle track for a 12½-ton crane. It was built of GIANT PORTLAND CEMENT

MANUFACTURED BY THE

AMERICAN CEMENT COMPANY Philadelphia

## A NEW DIVIDING PLATE For CURB and GUTTER..

The most simple and practical device on the market. Any contractor who builds curb and gutter will find this plate useful and economical. It is inexpensive, and we guarantee satisfaction. This and our

TIE and DIVIDING PLATES FOR CONCRETE SIDEWALKS

make a money and labor-saving combination

*See Description in Machinery and Trade Department of this magazine*

ZEISER BROS. Dept. E BERWICK, PA.

# LUFKIN

## TAPES AND RULES

ARE THE BEST IN THE WORLD.

Made by THE LUFKIN RULE CO.

FOR SALE EVERYWHERE.
SEND FOR CATALOG 188.

Saginaw, Mich., U. S. A.
New York. London.

# AQUABAR

## Waterproofing Compound

**The Only**

**Absolute, Reliable and Economical**

**Cement Waterproofer**

WRITE FOR DESCRIPTIVE MATTER

**THE AQUABAR COMPANY, Inc.**

**1228 Locust Street, Philadelphia, Pa.**

# Medusa Waterproof Compound

**IS NOT A WASH OR AN EXPERIMENT**

## MAKES CONCRETE IMPERVIOUS TO WATER

Write for pamphlet describing its various uses, cost, tests, and illustrating some of the largest jobs in this country in which it was used. Beware of imitations and adulterated compounds that are sold for less than it costs us to make Medusa.

Write for Free Sample of our Pure White Portland Cement.

**SANDUSKY PORTLAND CEMENT COMPANY : Sandusky, Ohio**

OBTAIN OUR PRICES ON MEDUSA PORTLAND. Annual Capacity 1,500,000 Bbls

# SUPERIOR CEMENT

Secure the best possible results by using
SUPERIOR CEMENT
in your concrete work

**LET US TELL YOU WHY**

## *The* Superior Portland Cement Company

Works—Superior, Lawrence County, Ohio
on D T & I, C & O and N & W Rys.

General Offices and Sales Department
Union Trust Bldg., Cincinnati, O.

# Nazareth Portland Cement

## One Mill-One Brand-One Quality-The Best

Uniform in color, strength and fineness
Every barrel and bag guaranteed both
as to quality and weight

## Charles Warner Company

General Sales Agt.—Main Office, Wilmington, Del.

**161 Devonshire St., Boston, Mass.**

**Land Title Bldg., Philadelphia  1 Madison Ave., New York**

ST. LOUIS PORTLAND CEMENT COMPANY

RED RING
ST. LOUIS
BRAND

**Uniform in Color and Strength**

**Always Reliable**

MARQUETTE PORTLAND CEMENT
CHICAGO

**SPECIFY the STANDARD BRAND**

**Marquette Cement Mfg. Co.**
CHICAGO

NO HYDROGEN — STRAIGHT CARBON MONOXIDE GAS PRODUCERS — NO CLINKERS

ABSOLUTE RELIABILITY
NO PRE-IGNITIONS
NO BACK-FIRING

GAS POWER CO.

CONTINUOUS OPERATION
NO PERIODICAL PULLING OF FIRE

TWO RECTOR STREET, NEW YORK CITY

BUILDERS & CONTRACTORS FOR COMPLETE FACTORY & WATERWORKS EQUIPMENT

DEXTER Portland Cement

DEXTER PORTLAND CEMENT CO.
TRADE MARK
PORTLAND
NAZARETH, PA.

SAMUEL H. FRENCH & Co., Philadelphia

Established 1866.
RUDOLPH S. BLOME CO.
PIONEERS IN
CEMENT PAVING AND CONCRETE CONSTRUCTION
BANK FLOOR, UNITY BLDG.
CHICAGO.

LARGER CONTRACTS EXECUTED IN ANY PART OF THE U. S.

ALMA CEMENT CO. WORKS ORETON & WELLSTON OHIO
PORTLAND
ALMA
CEMENT

**ALMA CEMENT COMPANY**

Works and General Office

WELLSTON, - OHIO


694

15 Mr 10